100 chalk farm road
london NW1 8EH

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acoustic assessment
sharps redmore

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one housing group

SHARPS REDMORE

ACOUSTIC CONSULTANTS

Report

100 Chalk Farm Road, Camden NW1

Acoustic Planning Report

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1.0 Background

1.1 Sharps Redmore (SR) have been instructed by the One Housing Group to assess the noise and vibration impact on a proposed new mixed use development at 100 Chalk Farm Road, Camden.

1.2 The site fronts directly onto Chalk Farm Road, a main two lane carriageway through Camden. The site is bounded to the rear (south) by a two track railway line used solely for freight traffic, with passenger trains at much greater distance on other lines to the south. To the west is the event venue 'The Roundhouse' and to the east is a petrol filling station. Under the site along Chalk Farm Road is the Northern Line underground tube.

1.3 Half the site of the proposed development is occupied by a multi-storey office building operated as One Housing Group's offices. The rest of the site includes a smaller two storey office and car parking. The site slopes down from the railway line at the rear to the main road at the front.

1.4 The proposed development is 8 storeys high. At ground level (Level 0) is proposed to include a supermarket, two B1 and one A3 uses which may extend to Level 1 at one side. Residential premises begin at Level 1 with 11 units, 12 units at Levels 2 & 3, reducing to 10 at Levels 4 & 5, 6 units at Level 6, and 2 units at Level 7.

1.5 The report is separated into various sections:

- Section 2 outlines design guidance criteria for the scheme, incorporating national and international guidance, present planning policy advice and local guidance.
- Section 3 provides details of the noise survey undertaken.
- Sections 4 and 5 assess the development proposals and make recommendations where necessary.
- Section 6 draws conclusions from the scheme.

1.6 An existing aerial plan is shown in Appendix A. Measurement results are presented in Appendix B. Appendix C provides guidance as to terminology and parameters used within the report. Appendix D reproduces the London Borough of Camden's Development policy document DP28 'Noise & Vibration.'

2.0 Acoustic Criteria

2.1 The most relevant noise guidance for this development in terms of a planning assessment is the National Planning Policy Framework (NPPF) which came into force in March 2012 which in essence replaces previous PPG and PPS documentation. This does not replace the previously referenced documents within PPG24 of BS 8233 & W.H.O. Guidelines for Community Noise 1999 which refers to internal noise criteria.

2.2 The NPPF sets out the Government's economic, environmental and social planning policies for England and *"these policies articulate the Government's vision of sustainable development."* In respect of noise, Paragraph 123 of the NPPF states the following:

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, while recognising that many developments will create some noise; 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

2.3 The NPPF references and reinforces the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

2.4 Together, the first two aims require that no significant adverse impact should occur. Hence a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

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

2.5 It is possible to apply objective standards to the assessment of noise and the design of new dwellings should seek to achieve these objective standards. Such guideline values are given in the World Health Organisation document "Guidelines for Community Noise" and these are replicated within a British Standard, BS 8233:1999.

2.6 The W.H.O. guideline values are appropriate to what are termed “critical health effects”. This means that the limits are at the lowest noise level that would result in any psychological, physiological or sociological effect. They are, as defined by NPSE, set at the Lowest Observed Adverse Effect Level (LOAEL), but do not define the level above which effects are significant (the SOAEL). Compliance with the LOAEL should, therefore, be seen as a robust aim.

2.7 The W.H.O. LOAEL guideline values are summarised in the following table:

Value	Guidance	Location
L_{AeqT} = 55 dB	Few seriously annoyed, Daytime and evening.	Continuous noise, outdoor living areas
L_{AeqT} = 50 dB	Few moderately annoyed, Daytime and evening.	Continuous noise, outdoor living areas
L_{AeqT} = 35 dB	Acceptable level to avoid speech interference, daytime and evening.	Continuous noise, Dwellings, indoors
L_{AeqT} = 30 dB	To avoid sleep disturbance at night.	Continuous noise, Bedrooms, indoors
L_{AMAX} = 45 dB	To avoid sleep disturbance at night.	Noise peaks, Bedrooms, indoors

2.8 The national interpretation of the W.H.O. guidelines is contained in BS8233: 1999 'Sound Insulation & Noise Reduction for Buildings'. (the WHO guidelines were in draft form at the time of publication). BS 8233 recommends the following good and reasonable design values.

			Good	Reasonable
Gardens	$L_{Aeq,T}$	=	50 dB	55 dB
Living rooms	$L_{Aeq,T}$	=	30 dB	40 dB
Bedrooms	$L_{Aeq,T}$	=	30 dB	35 dB
	L_{Amax}	=		45 dB

2.9 The proposed scheme includes balconies facing towards the railway line near the middle of the site. From projects completed by Sharps Redmore and our experience there are many residential schemes where balconies overlook railway lines in London. These are not normally likely to comply with the outdoor living criteria of 50-55 dB L_{Aeq} sometimes applied to balconies. It is generally accepted that a balcony provides additional amenity spaces with many other uses irrespective of its noise level; a place to dry cloths, to store bicycles, to grow small plants, so on and so forth and therefore cannot be judged against a single parameter.

2.10 This reasoning is in line with current thinking as expressed through draft new BS 8233 presently out for public consultation. This draft states:

> For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper limit of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these limits are not achievable in all

circumstances where development might be desirable. In higher noise areas, such as city centres, a compromise between elevated noise levels and the convenience of living in these locations is warranted. Where this situation occurs, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less may not be possible at the outer edge of these areas but should be achievable in some areas of the space.

2.11 The draft guidance indicates the application of this single guidance limit can stifle the amenity of small balconies particular in city centre environments where space is limited and its application is unnecessary.

2.12 Further in respect to the noise limit of 55 dB $L_{Aeq\ (day\text{-}time)}$ level within BS 8233; this is sourced from World Health Organisation guidance 'Guidelines for Community Noise' 1999, which states this criteria for a *steady, continuous noise,* i.e. not rail noise. W.H.O. references as its source as D. Gottlob "Regulations for community noise. Noise/News International, December 1995."

2.13 D Gottlob within this document discusses specifically rail noise, and noted that in a number of European countries there is a 5 dB relaxation on criteria known as the 'railway bonus' This 'bonus' concurs with the relationship table provided of the percentage of people highly annoyed and the derived L_{DN} noise level, where the same percentage of people annoyed from road traffic occurs for rail traffic at a level 5 dB higher.

2.14 Combining the two sets of guidance provides following design targets for this specific site:

Living rooms	$L_{Aeq,T}$	=	35 dB*
Bedrooms	$L_{Aeq,T}$	=	30 dB*
	L_{Amax}	=	45 dB**
Balconies	No criteria		

* These levels meet the BS 8233 'good' criteria. It is considered that if levels were to marginally exceed this criteria, they would still fall between good-reasonable under BS 8233 and be considered acceptable considering the site location.

** This relates to typical maximum noise levels, not normally exceeding this level, not all maximum levels.

2.15 This is considered a robust but balance view in the context of policy direction, the specifics of the site and could be considered as representing compliance with the robust LOAEL. If a planning consent was achieved without imposition of specific internal noise limits, some flexibility can be available, but this should not exceed the BS 8233: 1999 'reasonable' limits as this could imply criteria above the SOAEL.

Atmospheric Building Services Noise Emissions

2.16 The ground level retail units are likely to introduce new building services noise sources which will operate day-time and some potentially in the night. The atmospheric noise emitted from this plant needs to be satisfactorily controlled to avoid the likelihood of disturbance to neighbours. In this case the nearest existing residential neighbours are properties on the opposite side of Chalk Farm Road. However noise levels will also need to be considered to the new residential properties which form part of the development, and which will be the closest new neighbours to the plant.

2.17 The standard approach for the assessment of new mechanical plant in residential areas is BS 4142: 1997, "Rating industrial noise affecting mixed residential and industrial areas." This standard assesses the likelihood of complaint by comparison of the existing background noise level, L_{A90}, with the specific 'rated' noise level of the new mechanical noise L_{Ar}, defined by the L_{Aeq}, parameter. The 'rated' level, L_{Ar}, is the L_{Aeq} noise level plus a 5 dB penalty if the noise source is judged to have any characteristics which draws attention to itself. The method of assessment states that if the difference between the 'rated' noise level of the plant is 5 dB greater than the background level, then the likelihood of complaint is of marginal significance. If the rated level is 10 dB above the background level, then complaints are likely. If the rated level is 10 dB below the background level, then complaints are unlikely.

2.18 The local authority guidance is based on BS 4142, provided in Appendix B and discussed in Section 4.

Vibration

2.19 BS 6472:2008 (Part 1) provides guidance on the vibration in buildings with respect to human annoyance or complaints about interference with activities. The vibration levels are expressed as vibration dose values (VDV), which relates to the level of vibration of an event and the number of occurrences of events in a period of time. For residential buildings, BS 6472:2008 (Part 1) states the following VDV's which might result in various degrees of adverse comment:

Vibration Dose Value ranges which might result in various probabilities of adverse comment within residential buildings			
Place and time	Low Probability of Adverse Comment ($m.s^{-1.75}$)[1]	Adverse Comment Possible ($m.s^{-1.75}$)	Adverse Comment Probable ($m.s^{-1.75}$)[2]
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

[1] Below these ranges adverse comment is not expected

[2] Above these ranges adverse comment is very likely

In terms of PPV (Peak Particle Velocity), BS 5228-2:2009 provides guidance which is reproduced below:

Vibration Level	Effects
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies people are less sensitive to vibration
0.3 mm mm/s	Vibration might be just perceptible in residential environments
1 mm/s	It is likely that vibration of this level in residential areas will cause compliant, but can be tolerated if prior warning and explanation has been given to residents
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Local Authority Requirements

2.20 The scheme is within the London Borough of Camden. The Borough resolved to adopt its Core Strategy and Development Policies on 8 November 2010. The Core Strategy is stated as their principal document in the Local Development Framework (LDF) and provides the vision, objectives and spatial policies to guide development in the borough until 2025.

2.21 Development policy documents are included within the adopted LDF. The primary document in respect to 'Noise and Vibration' is DP28. DP28 states that it seeks

> *to ensure that noise and vibration is controlled and managed and will not give planning permission for a development likely to generate pollution* or *development sensitive to noise in locations with noise pollution unless appropriate attenuation measures are provided*.

2.22 Various criteria are set out within DP28. DP28 is reproduced in full in Appendix D and the criteria within this document are discussed in Section 4 as part of the overall assessment.

3.0 Noise Survey

3.1 A noise survey was undertaken on 3rd April 2013. The noise survey continued by remote monitoring until the morning of 8th April 2013 incorporating a weekend period.

3.2 Noise measurements were taken with Norsonic 140 & 118 sound level meters, and associated wet weather kits for auto-logging purposes. Additional hand held measurements were taken with a Bruel & Kjaer Type 2260 sound level meter. All meters were calibrated before and after use and showed no significant drift. Weather conditions were dry during the initial survey. Wind speeds were variable but over the whole monitoring were considered acceptable (with sufficiently periods of < 5 m/s) Periods of light rain were expected over whole measurement period.

Noise Measurements

3.3 Measurements were taken at the following locations[1]:

A At roof level of One Housing Group facing over Chalk Farm Road, approximately 1 metre beyond the edge of the parapet (and generally in free field).

Ag Ground level - same façade directly below the roof location. Measurements were taken at 1.5 m above floor level and approximately 1 metre from the façade.

A1st 1st floor open walkway – on the same façade directly below Location A.

B At roof level of One Housing Group facing towards the railway line approximately 1 metre beyond the edge of the parapet. (and generally in free field).

C At ground level on the rear site boundary next to an open mesh fence 4 metres from the nearest track and 8 metre from the furthest track. Measurements were taken at 1 metre height.

D At a first floor walkway to the side of the One Housing Group building, facing the Roundhouse, close to the corner to the building and Chalk Farm Road and with a half view of the road.

E At a first floor walkway to the side of the One Housing Group building, facing the Roundhouse, set further back from Location D but with limited view of the road and a main view of the Roundhouse extract vents.

3.4 Auto-logging measurements were taken over 5 minutes sample periods on the road side, and 2 minute samples on the rail side.

3.5 Appendix A shows the measurement locations from an aerial view of the site.

3.6 The results of the surveys are presented in chart form for Locations A & B (Charts 1 and 2 respectively in Appendix B). The key noise parameters are the L_{Aeq} (ambient) and L_{A90} (background) and L_{Amax} (maximum). The associated tabulated results are shown for the

[1] Measurements were not possible at mid-height from the One Housing Group.

auto-logging measurements for both locations, plus typical frequency spectrum information.

3.7 The tabulated results of the noise measurements taken at ground level at the front and rear of the site are also shown (Ag & A1st), plus those at Locations C, D & E.

3.8 In summary the charts and tables indicate the following

Roadside

- Roof measurements indicate free field noise levels on the *front façade* of the site overlooking Chalk Farm Road as:

  Day-time 66-68 dB $L_{Aeq, 16\ hr}$

  Night-time 63-65 dB $L_{Aeq, 8\ hr}$ Typical L_{Amax} levels at night of 78-84 dB.

  Note the maximum noise levels from road noise are taken as the level exceeded for 90% of the time. This allows for the exclusion of the highest peaks which can provide a false impression from odd sources. In this case the highest peaks in the mid-high 90 dB's, but these are identified as primarily emergency sirens, and therefore excluded from the survey. Background noise levels are between 48-56 dB L_{A90} during the day-time reducing to 44 dB during the night. Chart 1 showing the 5 minute auto-logger measurement results highlighting the day and night-time periods.

- Ground level and first floor entrance walkway measurements (Locations A_g & A_{1st}) indicate levels which when corrected to free field are 67-68 dB L_{Aeq} with maximum levels of 76-80 L_{Amax}. Therefore there is little to no change with height.

- Measurements at 1st floor (Locations D & E), indicate free field levels of 64-67 dB L_{Aeq} at the corner with Chalk Farm Road, reducing when only a few metres further back, but increasingly screened from the road to 57-59 dB L_{Aeq}

Railside

- Roof measurements at Location B indicate free field noise levels on the *rear façade* of the site overlooking the rail line as:

  Day-time 55-59 dB $L_{Aeq, 16\ hr}$

  Night-time 54-57 dB $L_{Aeq, 8\ hr}$ Typical L_{Amax} level 73 up to 88 dB*

  * See 4.10.

  Background noise levels are between 46-49 dB L_{A90} during the day-time reducing to 45 dB during the night. Chart 2 shows the 2 minutes auto-logger measurement results.

- At Location C maximum noise levels of one near side event measured was 98 dB L_{Amax}. A significant number of far side track events were measured at between 80-93 dB L_{Amax}. The freight trains move slowly along this stretch of line normally taking around 1-2 minutes to pass. The trains regularly stop directly outside the site awaiting traffic lights before moving off. When stopped, engine/carriage noise was not particularly noticeable.

4.0 Noise Assessment

4.1 The assessment considers the noise environment around the new proposed development based on the surveys undertaken and guidance criteria.

4.2 Camden's Council policy document DP28 considers planning permission should not to be granted where noise levels are equal to or greater than[2]:

72 dB $L_{Aeq\ 12hr\ (07.00\text{-}19.00hr)}$, 72 dB $L_{Aeq\ 4hr\ (19.00\text{-}23.00hr}$), 66 dB $L_{Aeq\ 8hr\ (23.00\text{-}07.00hr}$) - Road

74 dB $L_{Aeq\ 12hr\ (07.00\text{-}19.00hr)}$, 74 dB $L_{Aeq\ 4hr\ (19.00\text{-}23.00hr}$), 66 dB $L_{Aeq\ 8hr\ (23.00\text{-}07.00hr}$) - Rail

And attenuation measured will be required where levels are equal to our greater than:

62 dB $L_{Aeq\ 12hr\ (07.00\text{-}19.00hr)}$, 57 dB $L_{Aeq\ 4hr\ (19.00\text{-}23.00hr}$), 52 dB $L_{Aeq\ 8hr\ (23.00\text{-}07.00hr}$) – Road

65 dB $L_{Aeq\ 12hr\ (07.00\text{-}19.00hr)}$, 60 dB $L_{Aeq\ 4hr\ (19.00\text{-}23.00hr}$), 55 dB $L_{Aeq\ 8hr\ (23.00\text{-}07.00hr}$) – Rail

+ 82 dB $L_{Amax\ (slow\ time\ weighting}$) – road and rail

4.3 Note when reviewing the minimum sound reduction performances ahead:

- For rooms with windows on the ends of the building the sound reduction requirements can presently be reduced by 3 dB.
- Calculations have presently assumed a generic window area 1/3rd of the total wall area per room. If a window is of significantly greater area then the performances may increase or may similarly decrease if the window area is smaller. However this also depends upon other wall element performances and specific room locations.

<u>Road traffic noise intrusion affecting façades with a view of Chalk Farm Road</u>

4.4 The noise levels incident on the roadside façade from traffic indicate that living/dining rooms will be affected by average day-time levels of 67 dB $L_{Aeq\ 16\ hour\ (free\ field)}$, 67 dB $L_{Aeq\ 12hr\ (07.00\text{-}19.00hr),}$ 66 dB $L_{Aeq\ 4hr\ (19.00\text{-}23.00hr}$) and 64 dB $L_{Aeq\ 8\ hour\ (free\ field)}$.

4.5 The front facade is therefore within Camden's DP28 limits for noise intrusion to grant permission and is within the range where attenuation measures would be required.

4.6 DP28 does not provide guidance as to acceptable internal noise levels, hence the limits in 2.14 are recommended. The following minimum sound reduction requirements are therefore proposed:

Façades with a view of Chalk Farm Road
(including the Roundhouse side and towards the petrol filling station)

Living/dining rooms: Walls 50 dB R_w

[2] DP28 states noise levels which are 1 metre from the façade but not defined as 'façade' or 'free field.' These are therefore taken as free field values, as the values used are the same as those under the now superseded (but then current) PPG 24 which were free field values.

	Windows	42 dB R_w
	Ventilation	37 dB $D_{ne,w}$
Bedrooms:	Walls:	50 dB R_w
	Windows	49 dB R_w
	Ventilation	No ventilation through this façade unless a heavily attenuated system or route. No window trickle vents.

4.7 As examples of glazing arrangements that when incorporated within a suitable frame could achieve the performance: 42 dB R_w – 10.8 mm pane 12 mm cavity 8.4 mm pane; 49 dB R_w 10/12/6 mm double glazing - 200 mm cavity -6 mm pane.

Rail noise intrusion affecting façades with a view of the line

4.8 The auto-logging data was examined for samples which included high noise levels over more than 1 sample period in any adjacent 2 minute period to establish those likely to be trains. If we consider the 90th percentile we obtain a maximum noise level of 81 dB L_{Amax} at Location B which from Chart 2 can be seen to encompass almost all maximum noise levels. Further prediction from the highest maximum levels measured manually on site at 4 m and 8 m can be predicted back to 81 dB L_{Amax} at the receiver, which provides some collaboration of the approach taken.

4.9 For the new build rear façade which is set back in to the site slightly closer to the line than Location B:

- a design noise level is predicted as 85 dB L_{Amax} at this facade.
- with design noise levels of 61 dB $L_{Aeq\ (night\text{-}time)}$ and 63 dB $L_{Aeq\ (day\text{-}time)}$ (typical worst case estimate)

4.10 The following minimum sound reduction requirements are proposed for the facades with a view of the railway line:

Façades with a view of rail line set back to the middle of the site.

Living/dining rooms:	Walls	50 dB R_w
	Windows	38 dB R_w
	Ventilation	37 dB $D_{ne,w}$
Bedrooms:	Walls:	50 dB R_w
	Windows	49 dB R_w
	Ventilation	50 dB $D_{ne,w}$ or no ventilation

4.11 As examples of glazing arrangements that when incorporated within a suitable frame could achieve the performance: 38 dB R_w – 8 mm pane 12 mm cavity 8.8 mm pane; 49 dB R_w 10/12/6 mm double glazing - 200 mm cavity -6 mm pane.

Façades with a view of rail line which are directly adjacent to the line.

4.12 For the facades which are directly adjacent to the railway line, the predicted day-time and night-time L_{Aeq} free field levels are 71 dB and 69 dB L_{Aeq} respectively (typical worst case

estimate). This night-time level exceeds the criteria set by Camden Authority by 3 dB in respect to allowing development. However the Camden limits are based on the now superseded Policy Planning Guidance 24, which allows for a 3 dB increase in limits *where there is a clear need for new residential development in an already noisy area*. Such flexibility is retained in the broader principles of NPPF, whist avoiding significant adverse impact. For the bedrooms which have a 90 degree angle view of the line, these will be within the criteria.

4.13 The proposed minimum sound reduction performances for the façades to living spaces are:

Living/dining rooms:	Walls	50 dB R_w
	Windows	47 dB R_w
	Ventilation	50dB $D_{ne,w}$ or no ventilation from this facade

4.14 As an example glazing arrangement that when incorporated within a suitable frame could achieve the window performance: 47 dB R_w – 16.8 mm pane 18 mm cavity 12.3 mm glazing. If balcony doors are included these may be acceptable if at least 90 degrees to the line and/or set significantly further back with a 43 dB R_w performance e.g. 12.8 pane 15 mm cavity 8.8 mm pane, as achieving greater performance may be difficult.

4.15 Maximum free field noise levels on the façade facing the line are between 93-98 dB L_{Amax}. These peaks in level would need a substantive sound reduction from walls and windows beyond normal systems to allow for bedroom to face the line and not typically exceed 45 dB L_{Amax} internally. If the L.B. of Camden were to accept noise sensitive dwellings facing the rail way line, then to achieve the acceptable internal noise criteria the sound reduction required would be:

Bedrooms:	Walls:	60 dB R_w + Octave assessment
	Windows	55 dB R_w + Octave assessment
	Ventilation	no ventilation through this faacde

4.16 These performances are significant. The walls and windows construction are anticipated to be at least 400 mm deep. The wall construction would be expected to include a 200 mm masonry façade and independent insulated inner plasterboard linings. The windows would be an enhanced double glazed outer system, a 400 mm cavity and 10 mm+ single inner pane, with acoustically lined reveals.

Roundhouse Noise Intrusion

4.17 The Roundhouse is sited directly adjacent to the site. It includes large ventilation grilles facing the site and some emergency exit doors. Activity or ventilation noise from the Roundhouse was not discernible during the manned day-time survey. The auto-logging period also included the Bianco contemporary circus event on the Saturday night (6th April). The rear auto-logging monitor, which although was not the closest location, was protected from the road traffic noise, and showed no significant change in the noise environment from non-event evenings.

4.18 This is a positive sign that the Roundhouse is significantly attenuated from its surroundings, and would be expected to be so as there are existing residential premises directly across Chalk Farm Road from the Roundhouse. Further DP28 (Table D) places strict noise control requirements on Entertainment activity such that similar levels of restriction might be presently anticipated for the Roundhouse.

4.19 Nevertheless as this is not definitive for larger music events where their impact might be greater, and which was not possible to include within the assessment, it is recommended that a noise condition allows for a future music event to be encompassed and any design impact reported.

Building Services Plant Noise Emissions

4.20 The retail tenancies at ground level will include various mechanical plant per tenant. Based on the guidance within DP28 and the advice within BS 4142 it is recommended that the cumulative noise limit for plant at any of the nearest windows do not exceed 10 dB below the pre-existing background noise level. This will require attenuation of ducted plant and may require screening or on board attenuation of external plant.

4.21 The noise survey indicated minimum background noise levels, L_{A90}, during the day of 46 dB and 44 dB during the night. Therefore plant noise levels are proposed to be controlled to:

36 dB L_{Aeq} (07.00-23.00 hrs)

34 dB L_{Aeq} (when operating during the night)

4.22 This is strict criteria and under BS 4142 is unlikely to lead to compliant.

4.23 In accordance with DP28 these limits can be relaxed by 5 dB if the plant does not show any distinguishable characteristics which draw attention to themselves. Under BS 4142 this would still ensure a likelihood of compliant which was very low.

Sound Reduction between ground floor retail and first floor residential

4.24 The sound reduction required between the first floor residential units and the ground floor retail tenancies will need to achieve at least Building Regulations Part E sound reduction requirements. As further protection, if required, tenant agreements can include for maximum operating noise levels, such that if they wish to operate louder than these levels they will be required to take additional noise control measures as part of their fit-out. In the same way individual tenancy agreements can include for maximum plant noise limits to ensure on-going control of noise emissions if tenant occupiers were to change.

5.0 Vibration & Structure-borne Noise Measurements and Assessment

Vibration & Structure-borne Noise

5.1 Initial vibration levels were measured during the noise survey on 3rd April 2013 with a Vibrock vibration meter, connected to a tri-axial accelerometer. A further survey was undertaken on 3rd July 2013 using a Bruel & Kjaer Type 2260 sound level meter, with adapted accelerometer. All meters were calibrated before and after use and showed no significant drift.

5.2 Peak Particle Velocity vibration levels were measured at two locations; next to the railway line (Location C) and internally within the ground floor reception toilet of the One Housing Group. Subjectively there was no significant sense of movement in either location. The PPV levels were measured on the ground floor in the adjacent toilet to the interview room on the vinyl covered concrete floor.

5.3 Structure-borne noise measurements were undertaken internally within a ground floor office at the rear of the One Housing Group building; They were then followed by a second survey with additional measurements with the first floor cellular office and open plan office, and second floor cellular office.

5.4 Within all the rooms of the One Housing Group noise from the underground trains (which was understood to be from the Northern Line) were noticeable. These train events were typically no more than 16 seconds long with maximum noise levels of 44-47 dB L_{Amax} on the ground floor, 40-47 dB L_{Amax} on the first floor and 43-49 dB L_{Amax} on the second floor, and were subjectively consistent.

Vibration

5.5 DP28 requires vibration levels within dwellings to not exceed the following, which are almost in line with those within BS 6472.

0.2-0.4 VDV $ms^{-1.75}$ (day-time) and 0.13 VDV $ms^{-1.75}$ (night-time).

Underground trains

5.6 Measurements of vibration of a sample of underground trains within the ground level of the One Housing Group building indicated PPV levels of 0.24-0.26 mm/s. The predicted VDV level from the regular northern line trains, indicate a 16 hour day-time level 0.02 $m/s^{-1.75}$; and by definition lower at night. Therefore in both cases there is low probability of adverse comment or level of perception. This is likely to remain unchanged across all floors.

Underground Noise Intrusion

5.7 DP 28 states *"Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35dB(A)max."* [3]

[3] This level is generally in line with present guidance (such as for Cross-rail and DART underground (Dublin)). Though the reference should be treated as 35 dB $L_{Amax(slow\ time\ weighting)}$.

5.8 As noise levels measured from the Northern Line across all floors are between 40-49 dB L_{Amax} these exceed this criterion. With the projected building proposed to be of a similar construction to the existing, it is anticipated that the design would need to incorporate a structure-borne isolation layer either at foundation level or between the first and ground floor structures.

Freight traffic

5.9 Directly adjacent to the freight line (at Location C), roughly equivalent to the nearest proposed building line, PPV levels were of the order between 0.3-0.45 mm/s which indicates vibration might be perceptible in residential buildings. However, there is no standard guidance as to the threshold of complaint or nuisance. The fact that vibration may be perceptible does not necessarily mean it is unacceptable and residents choosing to live this close to the railway might expect some levels of vibration to be detectable. VDV are not useful in this situation as there is no regularity necessarily to the activity.

5.10 Further the ground surface available for accurate measurements is not ideal at this side of the site and therefore it would be proposed that this is re-assessed as part trial piling or during geotechnical works.

5.11 It may be the case that some moderate vibration control measures can be included along the foundation line at this point such as provided by a vertical isolation/soft strip within the ground works at this boundary.

6.0 Conclusions

6.1 Sharps Redmore have reviewed the acoustic aspects of the proposed mixed use development on Chalk Farm Road.

6.2 The assessment has considered noise and vibration incident upon the proposed development, and proposed acoustic performance requirements where suitable.

6.3 In providing this advice the report has utilised national and local guidance requirements and associated standards. The following are the primary conclusions with respect to noise.

- When comparing the site requirements against those of DP28, the site falls within these noise boundaries, on all bar the closest facade of the building to the freight line at night. The levels and regularity of exceedance is highly dependent upon the activities levels of freight which is not necessarily timetabled. Where there is marginal non-compliance this is not so surprising as evidence from residences on the opposite side of the line indicate a building with non-habitable facing windows. This may imply that Camden accept residential development close to the line potentially exceeding their criteria, but that this needs to be with non-habitable windows. If Camden accept the principle of this side of the development as proposed, this would presumably be only on the basis that the internal guidance criteria is met.

- On the closest rail side facades the build necessary to meet this guidance would require of bedrooms a thick and heavy structure, of the order of 400 mm deep with secondary glazing at a similar void depth and bedroom ventilation would be attenuated and not from the rail facing facades.

- The façade sound insulation of the roadside façades will require enhanced double glazing. Bedrooms may require secondary, 2+1 or very enhanced double glazing, and attenuated ventilation.

- Noise from the Roundhouse was not noticeable/detectable during the manned or auto-logging assessment, which gave a good indication that this was likely to already be well controlled by the Roundhouse management and physical noise control strategy. However due to the intermittency of music events the survey could not encompass the potential louder events. It is proposed that this is therefore a conditioned requirement.

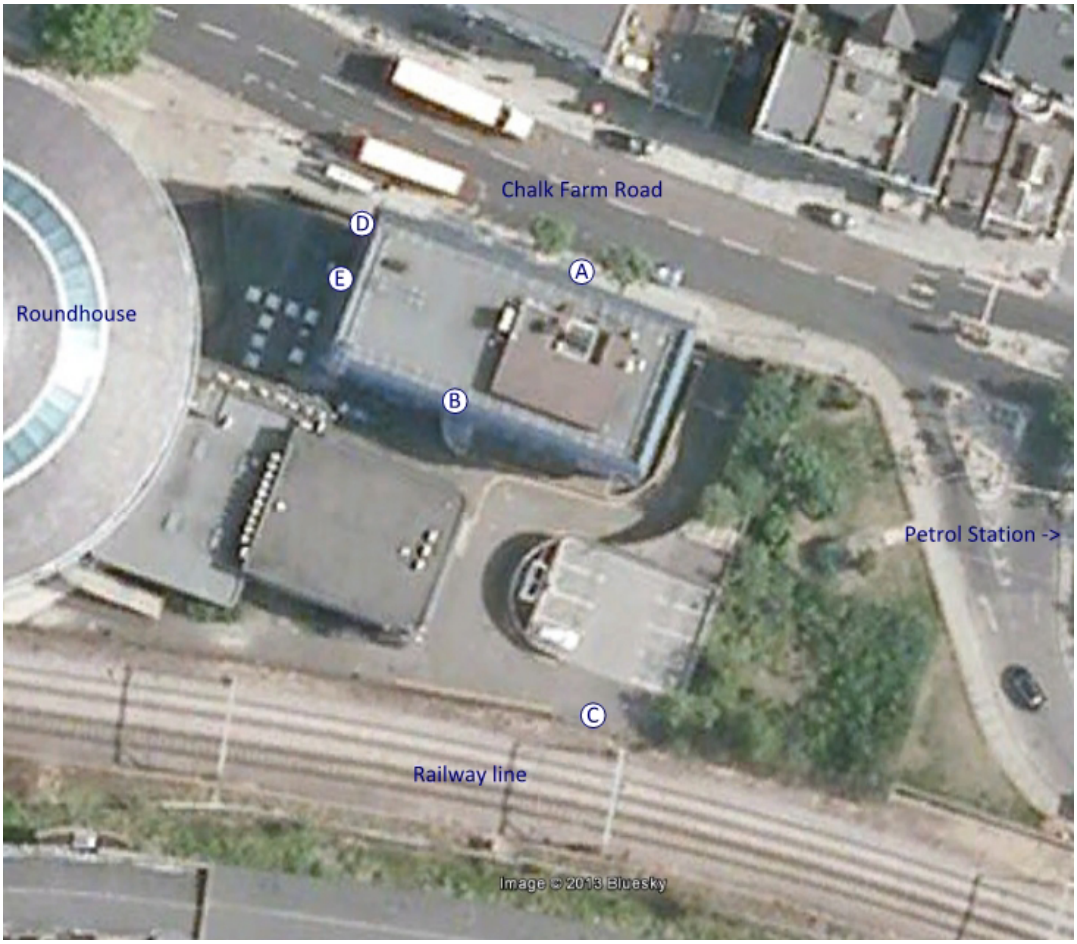
- Potential future plant noise emissions from the ground floor retail units have been limited to the criteria proposed within Camden's DP28 policy.

Vibration & Re-radiated Noise

- Vibration levels from the underground trains are considered to be within guidance with a low probability of complaint. Noise from underground trains are noticeable at all floor levels and exceed Camden's criteria. Control measures are likely to need to be incorporated at design stage encompassing a structure-borne isolation layer either at foundation level or between the first and ground floor structures.

- Vibration from the freight line activity indicates that a low to marginal possibility of vibration could be perceptible and associated re-radiated noise, such that similar or lesser control measures to those of underground trains could be incorporated.

Appendix A Aerial view of the site, and measurement locations



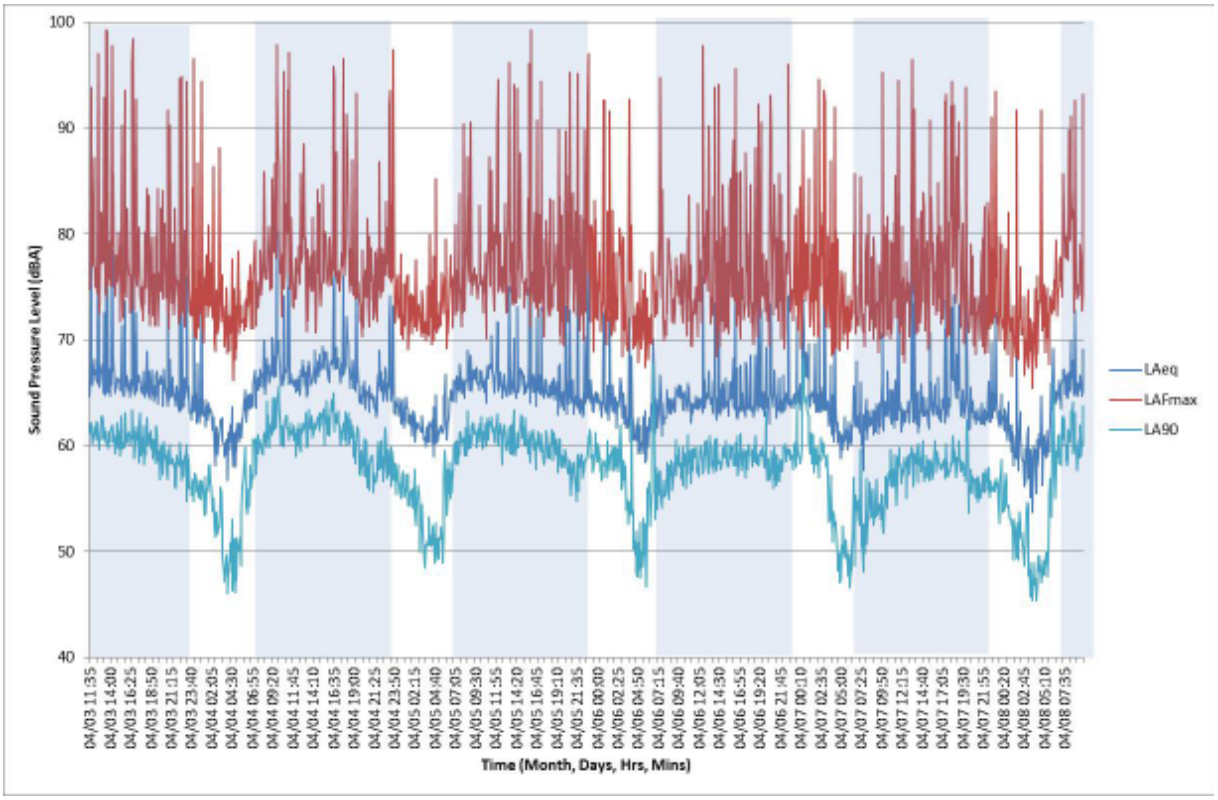
Appendix B Noise Survey Results

Location A - Roadside

Date	Day/Night	LAeq (dB)	LAFmax* (dB)	LAFmin (dB)	LA90 (dB)
03.04.13	Day	69		52	56
03.04.13	Night	65	78	43	46
04.04.13	Day	68		52	56
04.04.13	Night	64	78	45	49
05.04.13	Day	68		52	55
05.04.13	Night	65	81	47	44
06.04.13	Day	66		50	54
06.04.13	Night	66	84	43	47
07.04.13	Day	66		45	48
07.04.13	Night	63	78	44	45
08.04.13	Partial Day	67		54	58

	Linear Octave Band Centre Frequencies (Hz)								
	63 Hz	125 Hz	250 Hz	500 Hz	1.0kHz	2.0kHz	4.0kHz	8.0kHz	Awgt
Typ. Lmax Spectrum (dB)	95	87	81	83	77	76	71	67	84.0
Typ. Leq Spectrum (dB)	75	69	67	66	63	60	51	44	68.0

Chart 1 Chalk Farm Road side roof level measurements



Location B – Rail Side

Date	Day/Night	LAeq (dB)	LAFmax (dB)	LAFmin (dB)	LA90 (dB)
03.04.13	Day	59	84	46	47
03.04.13	Night	54	80	44	45
04.04.13	Day	59	89	48	49
04.04.13	Night	55	87	44	45
05.04.13	Day	58	82	48	49
05.04.13	Night	56	82	44	45
06.04.13	Day	56	86	46	48
06.04.13	Night	56	81	44	45
07.04.13	Day	55	84	45	46
07.04.13	Night	57	88	44	45
08.04.13	Partial Day	56	73	49	51

Chart 2 Rail side roof level measurements

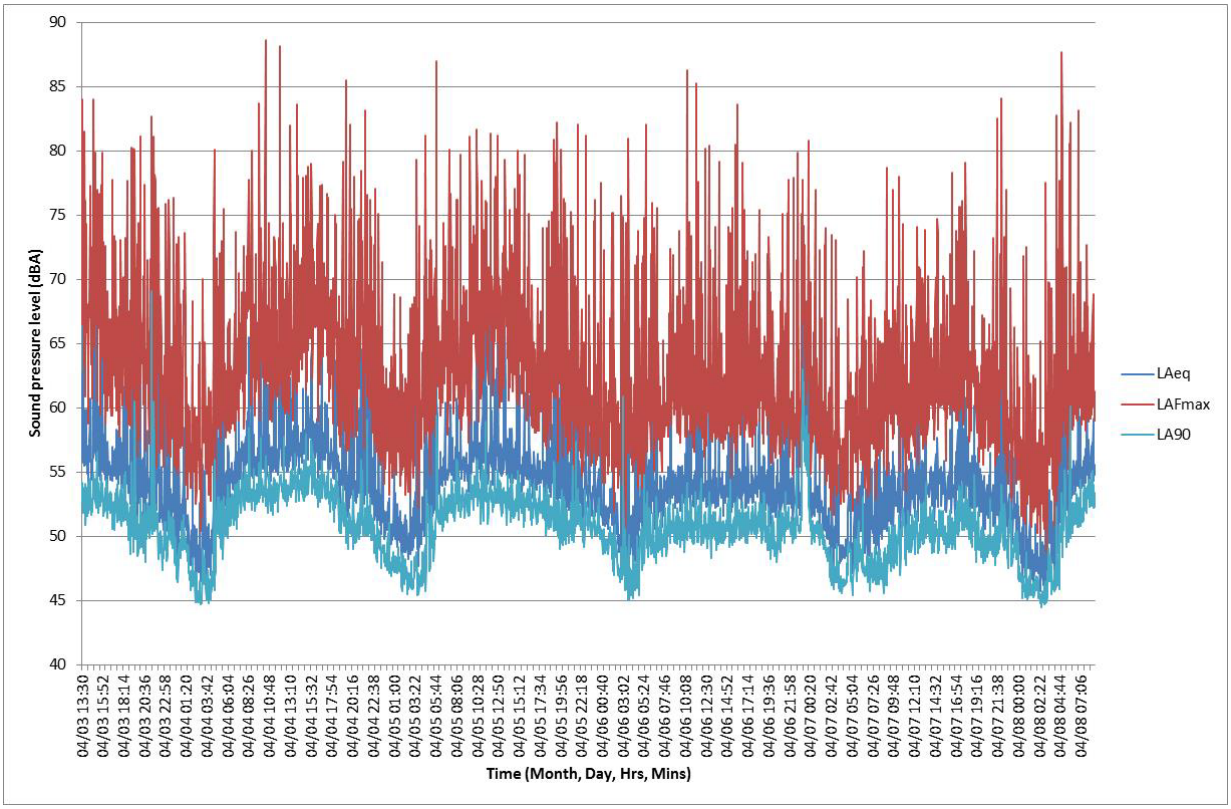


Table 1: Ground & 1st floor level measurements around One Housing Group building (façade)

Location/Time	LA90 (dB)	LAeq (dB)	LAmax (dB)
Ag (12.20->	59.4	71.2	80.6
A1st	61.6	69.8	79
D	60	67.5	83.2
E	57.2	62.1	71.5
A1st	62.6	69.3	82.5
D	59.2	66.5	85.8
E	54.6	60.2	68
A1st <-13.45)	61.2	69.9	79.2

Table 2: Ground Level Measurements at boundary with rail line (train events)

Train Events / Track	LA90(dB)	LAeq(dB)	LAmax(dB)	LAe (dB)	Time period / Notes
Nearside		83.2	97.9	102.8	90 secs
Farside		75.6	92.5	95.3	93 secs
Farside		76.3	93.3	95.1	75 secs
Farside		68.6	81.7	85.5	49 secs (stopping)
Farside		66.8	80.1	85.7	78 secs (stopping)
Farside		67.5	82.5	86.5	78 secs (stopping – 1st half)
Farside		68.1	79.3	88.1	99 secs (continuing -2nd half)
Nearside*		64.7	70	83.3	72 seconds (nearside)

* Noise level from roof (Location B).

Table 3: Internal noise levels of train events with One Housing Group

Ground floor interview room					
Train Events / Track	LA90(dB)	LAeq(dB)	LAmax(dB)	LAe (dB)	Time period / Notes
Event	41.2	44.2	47.4	56.2	≈16 secs
Event	35.6	40.6	44.3	52.6	≈16 secs
Event	36.6	42	46.7	53.8	≈16 secs
Background	35	36	-	-	-
First floor cellular office					
Train Events / Track	LA90(dB)	LAeq(dB)	LAmax(dB)	LAe (dB)	Time period / Notes
Event	35.2	39.7	43.4	52.3	≈16 secs
Event	33.4	38.8	42.7	49.9	≈16 secs
Event	38.8	40.3	43.9	47.3	≈16 secs
Event	36.8	39.1	42.3	48.6	≈16 secs
Event	33	37.1	40.2	47.9	≈16 secs
Event	38.2	40	44.8	49.5	≈16 secs
Event	38	40.3	43.3	49.8	≈16 secs
Event	37.6	40.3	42.9	48.1	≈16 secs
Event	36.4	40.5	44.5	49.6	≈16 secs
Event	34.8	38.4	41.9	48	≈16 secs
Average Background	32.4	34.0	-	-	-

First floor open plan office					
Train Events / Track	LA90(dB)	LAeq(dB)	LAmax(dB)	LAe (dB)	Time period / Notes
Event	37	40.7	45.3	49.1	≈16 secs
Event	37.2	40.8	45.2	49.9	≈16 secs
Event	37.8	40.8	44.7	49.9	≈16 secs
Event	35.4	36.2	37.3	45.8	≈16 secs
Event	38	40.8	46.1	49.8	≈16 secs
Average Background	38	40.8	-	-	-
Second floor cellular office					
Train Events / Track	LA90(dB)	LAeq(dB)	LAmax(dB)	LAe (dB)	Time period / Notes
Event	36.8	40.2	48.1	54.3	≈16 secs
Event	37.6	41.5	47.6	53.5	≈16 secs
Event	37.8	41	45.2	51.4	≈16 secs
Event	37.2	40.7	47.4	52.7	≈16 secs
Event	38.4	41.8	47.4	51.8	≈16 secs
Event	38.6	40.9	44.7	49.3	≈16 secs
Event	41	42.3	44.9	51.9	≈16 secs
Event	38	40.9	44.7	50.4	≈16 secs
Event	38.4	42	48.5	52.4	≈16 secs
Event	36.4	37.4	40.9	50.8	≈16 secs
Event	37.6	40.5	46	51.6	≈16 secs
Average Background	37.2	38.4	-	-	-

Appendix C: Common acoustic parameters

These are the main noise indices in use in the UK:

- *dB(A):* The human ear does not hear all frequencies with the same intensity. It is most sensitive to sounds in the 500Hz-8kHz range. Above and below this range the ear becomes progressively less sensitive. To compensate for this, sound level meters incorporate electronic filtering to correspond with the varying sensitivity of the ear. This filtering is called A-weighting and Sound Pressure Levels obtained with this weighting are referred to as A-weighted and signified as dB(A).

- *LA90:* The sound level (in dBA) exceeded for 90% of the time. This unit gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background noise level" of an area.

- *LAeqT:* The equivalent continuous sound pressure level over a period of time, T; (in dBA) This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the varying noise in question". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as road traffic, aircraft and trains.

- *LA1:* The sound pressure level (in dBA) exceeded for 1% of the time. This unit can give an indication of a regular maximum noise level from such activities as dance music.

- *LAe*: The sound exposure level, (previously denoted SEL) is the noise level of an event, such as a train or aircraft event, normally expressed in a 1 second time period.

- *LAmin:* The minimum sound pressure level (in dBA) measured over the time period.

- *LAmax:* The maximum level of sound (in dBA), i.e. the peak level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

- *PPV:* Peak Particle Velocity is the instantaneous maximum velocity by a vibrating element as it oscillates about its rest position.

- *VDV:* Vibration Dose Value (VDV) measure of the total vibration experienced over a specified period of time.

- *Rw:* Single figure weighted laboratory sound reduction index of a building element as tested in accordance with BS EN ISO 10140-2:2010 Acoustics. Laboratory measurement of sound insulation of building elements. Measurement of airborne sound insulation and Rated in accordance with BS EN ISO 717-1:2013 Acoustics. Rating of sound insulation in buildings and of building elements. Airborne sound insulation

- $D_{ne,w}$: Single figure weighted laboratory sound level difference of a small building element as tested to the same standards given for R_w.

DP28. Noise and vibration

28.1 Noise and vibration can have a major effect on amenity and health and therefore quality of life. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough. Camden's Core Strategy recognises the importance of this issue for Camden's residents and policy DP28 contributes to implementing a number of Core Strategy policies, including CS5 – *Managing the impact of growth and development*, CS9 – *Achieving a successful Central London*, CS11 – *Promoting sustainable and efficient travel* and CS16 – *Improving Camden's health and well-being*.

DP POLICY

DP28 – Noise and vibration

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; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

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 Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

28.2 The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.

28.3 The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, and for development likely to generate noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise. Where uses sensitive to noise are proposed close to an existing source of noise or when development that generates noise is proposed, the Council will require an acoustic report to ensure compliance with PPG24: *Planning and noise*. A condition will be imposed to require that the plant and equipment which may be a source of noise pollution is kept working efficiently and within the required noise limits and time restrictions. Conditions may also be imposed to ensure that attenuation measures are kept in place and effective throughout the life of the development.

28.4 In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below. These represent an interpretation of the standards in PPG24 and include an evening period in addition to the day and night standards contained in the PPG, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough.

Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L_{Aeq},12h	72 dB L_{Aeq},12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L_{Aeq},4h	72 dB L_{Aeq},4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L_{Aeq},8h	66 dB L_{Aeq},8h

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB L_{Aeq},12h	62 dB L_{Aeq},12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB L_{Aeq},4h	57 dB L_{Aeq},4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB L_{Aeq},1h	52 dB L_{Aeq},1h
Individual noise events several times an hour	Night	2300-0700	>82 dB L_{Amax} (S time weighting)	>82 dB L_{AMAX} (S time weighting)

Table C: Vibration levels on residential sites adjoining railways and roads at which planning permission will not be granted

Vibration description and location of measurement	Period	Time	Vibration levels
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	0000-2400	0.1 VDV ms-1.75
Vibration inside dwellings	Day and evening	0700-2300	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	2300-0700	0.13 VDV ms-1.75
Vibration inside offices	Day, evening and night	0000-2400	0.4 VDV ms-1.75
Vibration inside workshops	Day, evening and night	0000-2400	0.8 VDV ms-1.75

Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35dB(A)max

Table D: Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted

Noise description and measurement location	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day and evening	0700-2300	L_{Aeq}, 5m shall not increase by more than 5dB*
Noise at 1 metre external to a sensitive façade	Night	2300-0700	L_{Aeq}, 5m shall not increase by more than 3dB*
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	2300-0700	L_{Aeq}, 5m (in the 63Hz Octave band measured using the 'fast' time constant) should show no increase in dB*

* As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place

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) <LA90
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) <LA90
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) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL_{Aeq},

Key evidence and references

- Camden's Noise Strategy, 2002
- The London Plan (Consolidated with Alterations since 2004), 2008
- Planning Policy Guidance 24: Planning and noise