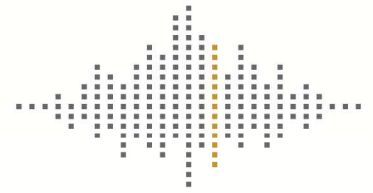


SHARPS REDMORE

ACOUSTIC CONSULTANTS ▪ Established 1990



Report

**Persephone Gardens,
London**
Acoustic Planning Report

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1.0 Introduction

- 1.1 Sharps Redmore (SR) has been instructed by Cudd Bentley Consulting to advise on acoustic related matters relating to a forthcoming planning application for a development proposal known as Persepone Gardens in Camden, London.
- 1.2 The proposals comprise the development of 82 C2 Care Units as well as, a 15-bed care home, amenity areas and associated infrastructure.
- 1.3 The site is occupied by a former subterranean reservoir and the proposed development will utilise this to create space both above and below ground (road) level.
- 1.4 Land usage around the proposed development is predominantly residential with existing housing surrounding the site (Gondar Gardens and Hillfield and Agamemnon Roads). Hampstead Cemetery sits to the north of the site beyond Gondar Gardens and West Hampstead police station lies closely to the east.
- 1.5 The nearest railway line (serving Cricklewood station to the West of the site) is at least 175m from the nearest site boundary. Ground-borne vibration from the railway is thus not considered to be a concern in this case and is not addressed herein.
- 1.6 This report subsequently assesses the existing noise climate measured at the site by SR (in February 2017) to determine whether the proposed development can ensure the amenity of future residents and preserve the amenity of existing, neighbouring residents in line with national and local planning policy, plus relevant acoustic design guidance.
- 1.7 This report is necessarily technical. A guide to common acoustic terminology is included in Appendix A.

2.0 Assessment methodology

National policy

2.1 The National Planning Policy Framework (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."* With respect to 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 condition;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

2.2 The NPPF 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."*

2.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level falls between a level which represents the lowest observable effect level (LOAEL) and a level which represents a significant observed effect level (SOAEL), then according to the explanatory notes in the NPSE:

"...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."

Local policy

2.4 The development site lies within the jurisdiction of the London Borough of Camden (LBC). LBC guidelines with regard to planning decision-making on noise and vibration are laid out in Section 6 of the Camden Local Plan 2016, Policy A4 'Noise and Vibration'.

2.5 Policy A4 states that:

“The Council will seek to ensure that noise and vibration is controlled and managed. Development should have regard to Camden’s Noise and Vibration Thresholds (Appendix 2). We will not grant planning permission for:

- a. development likely to generate unacceptable noise and vibration impacts; or*
- b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*

We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development.”

2.6 Appendix 2 of the Camden Local Plan contains their recommended thresholds for evaluating the significance of noise impact. These relate to the lowest observable effect level (LOAEL) and significant observed effect level (SOAEL) referred to in the NPSE:

“The significance of noise impact varies dependent on the different noise sources, receptors and times of operation presented for consideration within a planning application. Therefore, Camden’s thresholds for noise and vibration evaluate noise impact in terms of various ‘effect levels’ described in the National Planning Policy Framework and Planning Practice Guidance:

- *NOEL – No Observed Effect Level*
- *LOAEL – Lowest Observed Adverse Effect Level*
- *SOAEL – Significant Observed Adverse Effect Level*

Three basic design criteria have been set for proposed developments, these being aimed at guiding applicants as to the degree of detailed consideration needed to be given to noise in any planning application. The design criteria outlined below are defined in the corresponding noise tables. The values will vary depending on the context, type of noise and sensitivity of the receptor:

- *Green – where noise is considered to be at an acceptable level.*
- *Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.*
- *Red – where noise is observed to have a significant adverse effect.”*

2.7 For proposed developments likely to be sensitive to noise, LBC require that special consideration is given to noise sensitive developments that are proposed in areas which are, or expected to become, subject to levels of noise likely to have an adverse effect. The threshold of acceptability of the noise will primarily depend on the intended use of the noise sensitive development and the source of the noise likely to be experienced.

2.8 Table B from Appendix 2 presents guideline noise levels for evaluating the suitability of a proposed development exposed to existing noise and is reproduced below.

Table 2.1: Noise levels applicable to noise sensitive residential development proposed in areas of existing noise

Dominant Noise Source	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Anonymous noise such as general environmental noise, road traffic and rail traffic ~	Noise at 1m from noise sensitive façade/free field	Day	<50dB _{L_{Aeq,16hr}} *	- 50dB to 72dB _{L_{Aeq,16hr}} *	>72dB _{L_{Aeq,16hr}} *
		Night	<45dB _{L_{Aeq,8hr}} <40dB _{L_{Aeq,8hr}} **	45dB to 62dB _{L_{Aeq,8hr}} * >40dB _{L_{night}} **	>62dB _{L_{Aeq,8hrs}} *
	Inside a bedroom	Day	<35dB _{L_{Aeq,16hr}}	35dB to 45dB _{L_{Aeq,16hr}}	>45dB _{L_{Aeq,16hr}}
		Night	<30dB _{L_{Aeq,8hr}} 42dB _{L_{Amax,fast}}	30dB to 40dB _{L_{Aeq,16hr}} 40dB to 73dB _{L_{Amax,fast}}	>40dB _{L_{Aeq,8hr}} >73dB _{L_{Amax,fast}}
	Outdoor living space (free field)	Day	<50dB _{L_{Aeq,16hr}}	50dB to 55dB _{L_{Aeq,16hr}}	>55dB _{L_{Aeq,16hr}}
	Non-anonymous noise	See guidance note on non-anonymous noise			

*L_{Aeq,T} values specified for outside a bedroom window are façade levels

**L_{night} values specified for outside a bedroom window are free field levels

2.9 The LBC criteria for assessing anonymous noise inside bedrooms and in outdoor living spaces are generally in line with the guidance in British Standard 8233:2014 ‘*Guidance on Sound Insulation and Noise Reduction for Buildings*’, which is described further below.

2.10 In addition to existing noise sources affecting proposed sensitive development, LBC also provide guidance regarding the impact of new industrial and commercial-type noise sources on existing sensitive receivers. The guidance, based around British Standard 4142:2014 ‘*Methods for rating and assessing industrial and commercial sound*’, states:

“A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ (BS 4142) will be used. For such cases a ‘Rating Level’ of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion.”

BS 8233:2014

- 2.11 The LBC criteria for assessing anonymous noise inside bedrooms and in outdoor living spaces are generally in line with the guidance in British Standard 8233:2014 '*Guidance on Sound Insulation and Noise Reduction for Buildings*'. BS 8233 provides guideline internal design criteria for new residential developments. These are reproduced below.

Table 2.1: BS 8233:2014 indoor ambient noise levels for dwellings

Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

- 2.12 Achievement of the acoustic design criteria in Table 2.1 inside the finished development would fall within the LOAEL (Green) category according to LBC's guidance, and these criteria have therefore been adopted for the assessment of typical (dB L_{Aeq}) noise levels within the habitable rooms of the proposed development.
- 2.13 BS 8233:2014 does not contain specific guidance for assessing maximum noise levels affecting new residential development although it acknowledges that regular individual noise events can cause sleep disturbance. The LBC LOAEL (Green) category requires typical maximum noise levels not normally exceeding 42 dB L_{Amax} in bedrooms at night. Appropriate guidance is also given in the 1999 World Health Organisation (WHO) guidance document '*Guidelines for Community Noise*', which recommends that "*noise exceeding 45 dB L_{AFMax} should be limited, if possible*".
- 2.14 BS 8233:2014 states that for external amenity areas "*it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments*". This design range falls within the LOAEL to SOAEL (Amber) category according to LBC's guidance. Noise levels below 50 dB $L_{Aeq,T}$ would be required to be within the LOAEL (Green) category.

BS 4142:2014

- 2.15 It is expected that mechanical plant will operate as part of the proposed development's restaurant, pool and spa facilities.
- 2.16 The LBC criteria for assessing the impact of new industrial and commercial-type noise sources on existing sensitive receivers are generally in line with the guidance in British Standard 4142:2014 '*Methods for rating and assessing industrial and commercial sound*'.
- 2.17 BS 4142:2014 describes a method for the rating and assessment of sound or noise of an industrial and/or commercial nature according to the following summary process:

- i) Determine the background sound level, in terms of L_{A90} , at the nearest noise sensitive receptors of interest.
 - ii) Determine the specific sound level of the source being assessed, in terms of $L_{Aeq,T}$ level at the receptor locations. $T = 1$ hour for 0700-2300 day or 15 minutes for 2300-0700 night.
 - iii) Apply a rating level acoustic feature correction if the sound source has tonal, impulsive, intermittent or other distinctive characteristics.
 - iv) Compare the rating sound level against the background sound level; the higher the rating sound level is over the background sound level, the higher the likelihood of an adverse impact.
 - v) Differences (rating – background) of around +10 dB is likely to be an indication of significant adverse impact depending upon the context; a difference of +5 dB is likely to be an indication of adverse impact, depending upon the context. Where the rating level does not exceed the background sound level (L_{A90}) at the nearest receptor of interest, the indication is that the sound source will have a low impact, depending upon the context.
- 2.18 The significance of sound of an industrial nature and/or commercial nature (including building services and/or mechanical plant noise) depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which it is placed.
- 2.19 Based upon the LBC guidance, a 'Rating Level' no higher than 10 dB below background (15 dB if tonal) is the upper threshold of the LOAEL (Green) category. BS 4142 advises that *"a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context"*, therefore a 'Rating Level' between 10 dB below background and +5 dB above background falls within the LOAEL to SOAEL (Amber) category. A 'Rating Level' + 5dB or more above background would fall within the SOAEL (Red) category.

3.0 Survey details

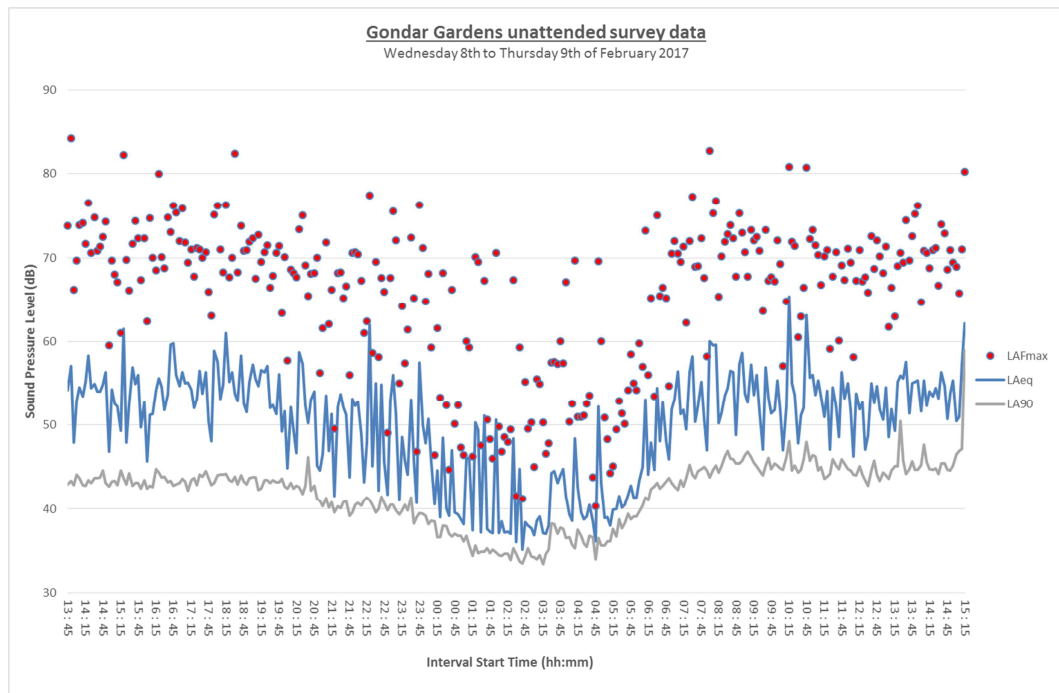
- 3.1 A survey of prevailing environmental noise levels affecting the site was carried out between Wednesday 8th and Thursday 9th February 2017.
- 3.2 Survey data was used to establish typical day and night-time average (L_{Aeq}) and night-time maximum (L_{AFMax}) noise levels, as well as the typical background sound level (L_{A90}) representative of the nearest noise-sensitive properties.
- 3.3 The survey comprised unattended monitoring at one location over a 24 hour period, supplemented by additional attended measurements at five locations on Thursday 9th February. The measurement positions are indicated clearly in Figure 3.1

Figure 3.1: Monitoring Locations



- 3.4 The microphone installation at the unattended monitoring position was approximately 2.5 metres above street level and 4.5 metres from the centre of Gondar Gardens.
- 3.5 Weather conditions were considered suitable for carrying out environmental sound level measurements; being dry and with wind speeds under 5 m/s.
- 3.6 Measurements were taken using a Norsonic 140 Class 1 precision sound level meter. The sound level meter was calibrated before and after use with no significant drift noted. The meter has a fully traceable calibration history.
- 3.7 Sound level measurements were taken at 5 minute intervals during the unattended and attended survey. In both cases measurements were taken in free-field conditions.
- 3.8 The average dB $L_{Aeq,5 mins}$, background dB $L_{A90,5 mins}$ and maximum dB $L_{AFMax, 5 min}$ noise levels were recorded during the survey. The results of the survey are presented in Figure 3.2.

Figure 3.2: Noise Survey Results



3.9 Table 3.1 summarises the survey results for day and night-time average dB $L_{Aeq, 16\text{ hrs}}$ and $L_{Aeq, 8\text{ hrs}}$, typical background dB $L_{A90, 5\text{ min}}$ and typical maximum $L_{AFmax, 5\text{ min}}$ noise levels recorded at the unattended measurement position.

Table 3.1: Survey measurement summary

Typical Ambient		Lowest Typical Background		Typical Max (Night) dB $L_{AFmax, 15\text{ min}}$
Daytime 0700-2300hrs dB $L_{Aeq, 16\text{ hrs}}$	Night-time 2300-0700hrs dB $L_{Aeq, 16\text{ hrs}}$	Daytime 0700-2300hrs dB $L_{A90, 15\text{ mins}}$	Night-time 2300-0700hrs dB $L_{A90, 15\text{ mins}}$	
55	47	44	35	51

3.10 Average and maximum noise levels were dictated by a combination of distant road traffic and natural noise sources on Gondar Gardens, typical of a relatively quiet urban site. Sources included distant (and to a much lesser extent local) road traffic and aircraft noise, bird song, and wind rustling vegetation.

3.11 Table 3.2 presents the octave-band levels for the proposed development, which have been used as part of the sound insulation assessment for the residential units.

Table 3.2: Octave-band linear frequency spectra

Parameter	Octave-Band Centre Frequency, Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Day dB L_{eq}	60	54	52	51	51	46	38	32	55
Night dB L_{eq}	54	49	45	44	43	38	33	30	47
Night typical dB L_{Fmax}	66	62	55	41	41	36	37	35	51

4.0 Existing noise sources affecting future residents of the development

Building envelope sound insulation

- 4.1 The survey results indicate that the façades of the development will be exposed to day and night-time average noise levels up to 55 dB $L_{Aeq,16hour}$ and 47 dB $L_{Aeq,8hour}$ respectively (equivalent to approximately 58 dB $L_{Aeq,16hour}$ / 50 dB $L_{Aeq,8hour}$ as reflected 'façade' levels) which will fall within LBC's LOAEL to SOAEL (Amber) category, the guidance for which suggests that the noise is observed to have an adverse effect level, but may be considered acceptable when assessed in the context of other merits of the development.
- 4.2 Ultimately if noise levels in the habitable rooms of the development do not exceed the BS 8233:2014 criteria summarised in Table 2.1 (equivalent to LBC's LOAEL (Green) category) then residents will be provided with an acceptable standard of internal acoustic amenity.
- 4.3 The external building envelope will therefore require a sufficient level of sound insulation against external incident environmental noise. The calculated minimum airborne sound reduction of building envelope elements to achieve the required standards are presented ahead in terms of 1/1 octave band R values for specification purposes.
- 4.4 Suitable products shall provide evidence of compliance in accordance with BS EN ISO 101040/2:2010 and rated in accordance with BS EN ISO 717/1:1998, or equivalent.

Façade

- 4.5 It is not confirmed if the external walls of the development are to be a lightweight framed system or a brick and/or block construction. Regardless of the system used, façades must meet the minimum sound insulation performance requirements detailed in Table 4.1. These performance requirements are the calculated sound reduction index (SRI) at each 1/1 octave band that would achieve the BS 8233:2014 and LOAEL internal noise limits.

Table 4.1: Minimum external wall specification

1/1 Octave-Band Centre Frequency, Hz							
63	125	250	500	1k	2k	4k	8k
17	19	14	22	38	41	33	34

- 4.6 The minimum performance requirements presented above are below even the most lightweight Metsec/steel frame-based systems and therefore it is the view of SR that the external walls of the development will meet the performance criteria needed to ensure acceptable internal ambient noise levels under BS 8233:2014; provided standard

Roof

- 4.7 To control noise ingress to the top floor of the development (primarily from rain noise), the roof combined with the ceilings to the top floor bedrooms would need to provide a sound reduction of at least 45 dB R_w . However if a composite lightweight build up is used, the minimum roof performance would need to rise to 50 dB R_w .

Window Systems

- 4.8 The window systems must be considered as the glazing, seals and frames combined.
- 4.9 The window systems should achieve the minimum sound reduction values in Table 4.2. These performance requirements are the calculated sound reduction index (SRI) at each 1/1 octave band that would achieve the BS 8233:2014 and LOAEL internal noise limits.

Table 4.2: Window system specification

1/1 Octave-Band Centre Frequency, Hz					
125	250	500	1k	2k	4k
17	23	21	31	31	27

- 4.10 The above indicative sound insulation requirements are the overall performances for the window systems (including frame, seal and glass). Once the requirements are confirmed it will be necessary to ensure that laboratory test data is provided to demonstrate that the window system as a whole achieves the acoustic performance standards. However, the above sound reduction performances would be achieved by the lowest specified thermal double glazing commonly in use and therefore it is the view of SR that window systems used in the development will meet the performance criteria needed to ensure acceptable internal ambient noise levels under BS 8233:2014; provided standard construction methods and materials are used.

Ventilation

- 4.11 Natural ventilation via open windows (which typically provide 10-15 dB attenuation) would result in the BS 8233 guideline limits being exceeded in parts of the development. However, if open windows are to be used for background ventilation, internal noise levels are still predicted to be within “reasonable” limits in accordance with BS 8233:2014.
- 4.12 If passive vents are to be utilised for background ventilation, these would need to provide the following minimum octave-band sound reduction specification (D_{ne}) when open:

Table 4.3: Ventilator system specification

1/1 Octave-Band Centre Frequency, Hz					
125	250	500	1k	2k	4k
31	34	36	33	34	33

- 4.13 The above specification could typically be met using ventilators with an overall weighted performance of 32 dB $D_{ne'w}$ (e.g. hit and miss trickle ventilator) and therefore it is the view of SR that any ventilators used in the development will meet the performance criteria needed to ensure acceptable internal ambient noise levels under BS 8233:2014; provided standard construction methods and materials are used.

External amenity areas

- 4.14 At this stage we understand that the development will provide external amenity space in the form of communal landscaped gardens at the rear of the site and private balconies and/or terraces to many individual dwellings.
- 4.15 Based on the noise survey data, typical daytime average noise levels in the front part of the site closest to Gondar Gardens do not exceed 55 dB $L_{Aeq, 16 \text{ hrs}}$. Average noise levels at the rear of the site and further from Gondar Gardens are typically 10 dB or more lower. Therefore the private residential balconies and/or terraces will be exposed to noise levels which fall within LBC's LOAEL to SOAEL (Amber) category on the worst-case elevation and the LOAEL (Green) category in most other areas.
- 4.16 Daytime average noise levels in the landscaped communal gardens at the rear of the site are expected to be no higher than 45 dB $L_{Aeq, 16 \text{ hour}}$, based upon the noise survey results. This would fall within the LOAEL (Green) category.
- 4.17 Furthermore, typical daytime average noise levels anywhere on the site are not expected to exceed the BS 8233:2014 upper guideline limit of 55 dB $L_{Aeq, 16 \text{ hour}}$. This provides further assurance that future occupants of this scheme could readily be provided with acoustically appropriate external amenity space, with no additional mitigation required.

5.0 Noise sources associated with the development affecting existing residents

Building services noise emissions

- 5.1 External noise emissions generated by building services and/or mechanical plant associated with the proposed development should be controlled to preserve the amenity of existing residential noise-sensitive premises in the vicinity of the site.
- 5.2 The cumulative 'Rating Level' from all building services should therefore not exceed the following day and night-time noise limits at 1 metre from the façade of the nearest existing noise-sensitive premises (expected to be existing residences on Gondar Gardens). These correspond to a 'Rating Level' not exceeding 10 dB below background, which would fall within LBC's LOAEL (Green) category.

Table 5.1: Proposed building services plant noise limits

Location	Period	Plant Noise Limit
1 metre from nearest noise-sensitive façade to development	Day-time (0700-2300hrs)	34 dB $L_{Aeq,1hr}$
	Night-time (2300-0700hrs)	25 dB $L_{Aeq,15min}$

- 5.3 Plant noise emissions exceeding these levels should be avoided where this is achievable. However, plant noise emissions between 10 dB below and +5 dB above background should fall within the LOAEL to SOAEL (Amber) category, the upper threshold of which is the point at which BS 4142 suggests is "an indication of an adverse impact, depending on the context". Plant noise emissions exceeding the LOAEL threshold would therefore not necessarily result in adverse noise impact on existing noise-sensitive receivers.
- 5.4 The design, layout and specifications for building services plant are still being developed. However, current proposals indicate that the building services strategy will require the provision of dry air coolers located in a dedicated plant zone on the roof of the building.
- 5.5 Current specifications indicate that each cooler will have a sound power level of 78 dB (A) which for a single unit would be expected to result in a sound pressure level of 42 dB (A) at 1m from the façade of the nearest existing residential property. This corresponds to a level 7 dB above typical night-time background noise levels, which is slightly above the threshold at which BS 4142 suggests an adverse impact is possible, depending on context. The installation of more than one of these units would increase the resultant noise level. Appropriate mitigation (e.g. screening, enclosure, directivity) will therefore need to be incorporated into the final design and specification of these systems to ensure there is no significant adverse noise impact, in line with LBC requirements and the BS 4142 guidance.
- 5.6 Current proposals also include the provision of a car lift serving the basement car park. This will require hydraulic equipment which can generate relatively high levels of noise, with the lift motor typically the source of the highest noise emissions. The lift motor is likely to be housed in a basement plant room, which will naturally inhibit noise emissions. However, use of the vehicle lift will also generate operational noise at ground floor level and it will therefore be important to ensure that noise emissions associated with the vehicle lift are adequately controlled in the final development design and specification.

- 5.7 Indeed, appropriate measures should be incorporated in the finished development to ensure cumulative noise emissions from all significant sources of external building services noise emissions do not result in any adverse noise impact on existing residents, in with LBC and BS 4142:2014 guidance. This should be relatively straightforward to achieve provided appropriate care is adopted in the onward design and specification of building services.

Vehicular noise impact

- 5.8 The potential impact on existing residents of additional vehicle traffic associated with the development has also been considered.
- 5.9 Transportation survey data provided by Cannon Consulting Engineers indicate that the current Average Annual Daily Traffic (AADT) is around 422 vehicles, while the projected (future) AADT is 462. This means that the AADT will increase by 40 vehicles (around 9%). This equates to 40 two-way trips, i.e. 20 arrivals at the development and 20 departures.
- 5.10 The additional trips are not expected to increase the typical maximum noise level existing residents are exposed to during the night-time as a result of vehicles on Gondar Gardens, particularly as 90% of these are predicted to occur between 0600-0000hrs and therefore only 10% (four two-way trips) during the most sensitive night-time period 0000-0600hrs.
- 5.11 An increase in overall vehicle numbers of 9% is also unlikely to result in any significant increase in longer-term day and night-time average noise levels, given that an effective doubling of road traffic typically equates to an increase of around 3 dB, which in turn is typically the minimum perceptible change in noise levels under normal conditions.
- 5.12 Additional vehicle traffic associated with the development is therefore not expected to result in any significant increase in prevailing road traffic noise levels, and subsequently no significant impact on existing residents of Gondar Gardens.

6.0 Conclusion

- 6.1 An environmental noise survey has been conducted and the prevailing noise climate at the site has been established.
- 6.2 Based on the results of the survey, environmental noise levels incident on the external façades of the development will fall within either the LOAEL to SOAEL (Amber) category for the Gondar Gardens elevation or the LOAEL (Green) category for most other areas.
- 6.3 Acoustic design specifications have been proposed for the external building envelope to ensure that internal noise levels in habitable rooms meet LBC' criteria for LOAEL (Amber) categorisation and the BS 8233:2014 guideline criteria. The required internal conditions can be readily achieved using minimum/standard construction methods and materials (e.g. using lightweight façade, standard thermal double glazing and trickle ventilators).
- 6.4 Maximum noise limits from building and/or mechanical services plant at the nearest noise-sensitive receptors have been proposed in accordance BS 4142:2014 and the criteria set out in Appendix 2 of the Camden Local Plan. Indicative calculations have been completed to assess preliminary details of external plant equipment, and no adverse impact on existing residents is expected provided appropriate care is taken in the design, specification and selection of building services equipment.
- 6.5 An assessment of vehicle traffic associated with the development indicates that the additional trips will not result in any significant impact on existing residents.
- 6.6 In summary, the noise impact both on and of the proposed development is expected to be acceptable provided standard building methods and materials are used and appropriate care is taken in the specification and selection of mechanical plant.

APPENDIX A

Acoustic Terminology

Acoustic Terminology

- A1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. $50 \text{ dB} + 50 \text{ dB} = 53 \text{ dB}$. Increases in continuous sound are perceived in the following manner:
- 1 dB increase - barely perceptible
 - 3 dB increase - just noticeable
 - 10 dB increase - perceived as twice as loud
- A2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.
- A3 To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).
- A4 The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p . Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p .
- A5 External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.
- A6 The main noise indices in use in the UK are:
- L_{A90} : The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.
 - L_{Aeq} : The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". 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 aircraft and trains.

L_{A10} : The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

L_{AMAX} : The maximum 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.

APPENDIX B

Extracts from the Camden Local Plan

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