

Finch Consulting Report.

Noise Impact Assessment at Sapphire Plaza, Reading.

Prepared for: Mapledurham Properties Ltd



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DISTRIBUTION

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TABLE OF CONTENTS

DISTRIBUTION	1
1.0 INTRODUCTION	3
2.0 SITE LOCATION.....	3
3.0 PLANNING POLICIES	5
4.0 NEIGHBOURING BUSINESSES	6
5.0 INCIDENT NOISE LEVELS	8
6.0 ASSESSMENT OF NOISE IMPACT	9
7.0 CONCLUSIONS.....	12
APPENDIX 1 –GUIDANCE DOCUMENTS	13
APPENDIX 2 – GLOSSARY	18



1.0 INTRODUCTION

- 1.1 It is currently proposed to convert the existing commercial building (office accommodation) called Sapphire Plaza (at Watlington Street, Reading, RG1 4TA) into residential accommodation. The avenue to secure this is via a Certificate of Lawful Development (permitted development rights) where a Class O permitted development application will be made to the Local Planning Authority.
- 1.2 When the Permitted Development order was made permanent an additional criterion was been added, stating that the Local Planning Authority must consider the 'impacts of noise from commercial premises on the intended occupiers of the development' when assessing applications.
- 1.3 This developer has in addition requested a review of the internal noise levels in the proposed habitable rooms in order to provide a degree of confidence to the development plans.
- 1.4 This report presents a quantitative assessment of the incident road traffic noise impact to the proposed new habitable rooms, a qualitative review of the impact of nearby existing businesses to the future occupants, and a review of potential plant noise impact to nearby noise sensitive premises.
- 1.5 To assist with the understanding of this report a brief glossary of acoustic terms can be found in Appendix 2. A more in-depth glossary of acoustic terms can be accessed at <http://www.acoustic-glossary.co.uk>.

2.0 SITE LOCATION

- 2.1 Sapphire Plaza is located in Reading. It is a standard office building built in the 1980s, comprising 5 floors and around 4000 m² of floor area. It is a detached building and includes a ground level car park. The River Kennet is located to the North, Watlington Street (A329) is located to the West, Kennet street to the south and a residential building is located to the East. The immediate neighbouring premises are residential in use.
- 2.2 The location of Sapphire Plaza is shown in Figure 1 below.



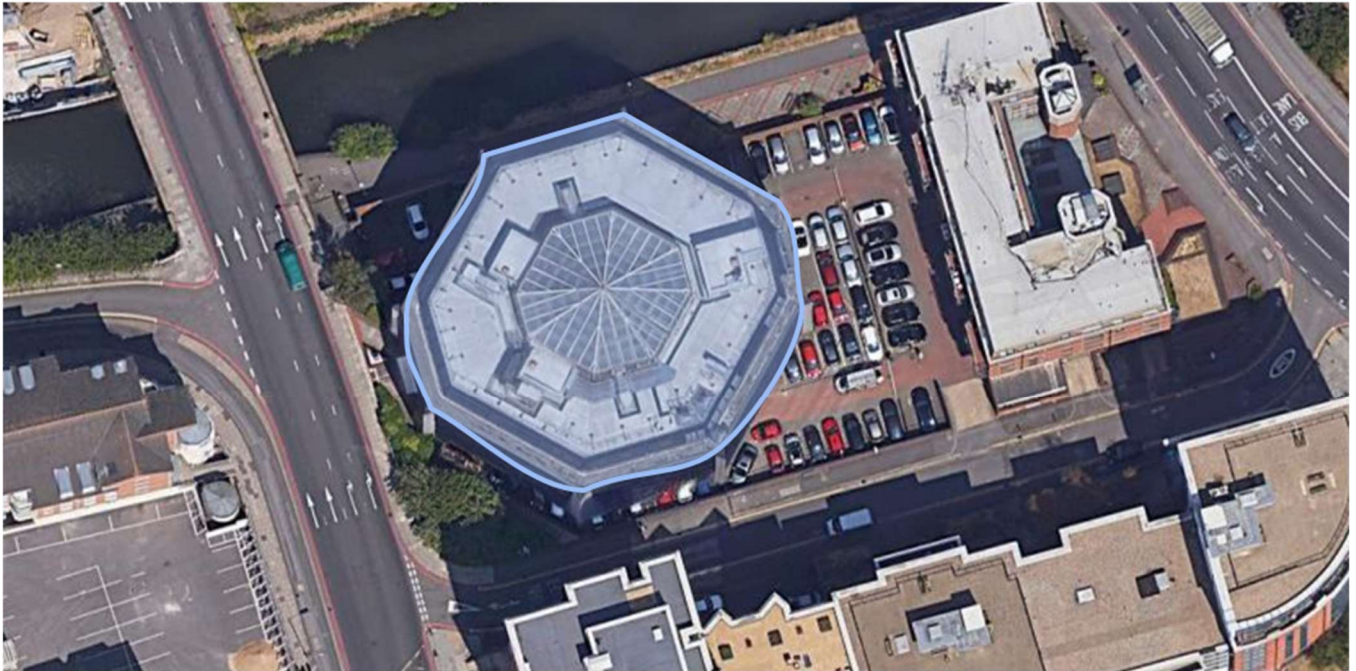


Figure 1: Sapphire Plaza Location Map

2.3 Figure 2 below shows a 3D layout of the Sapphire Plaza building alongside nearby buildings.

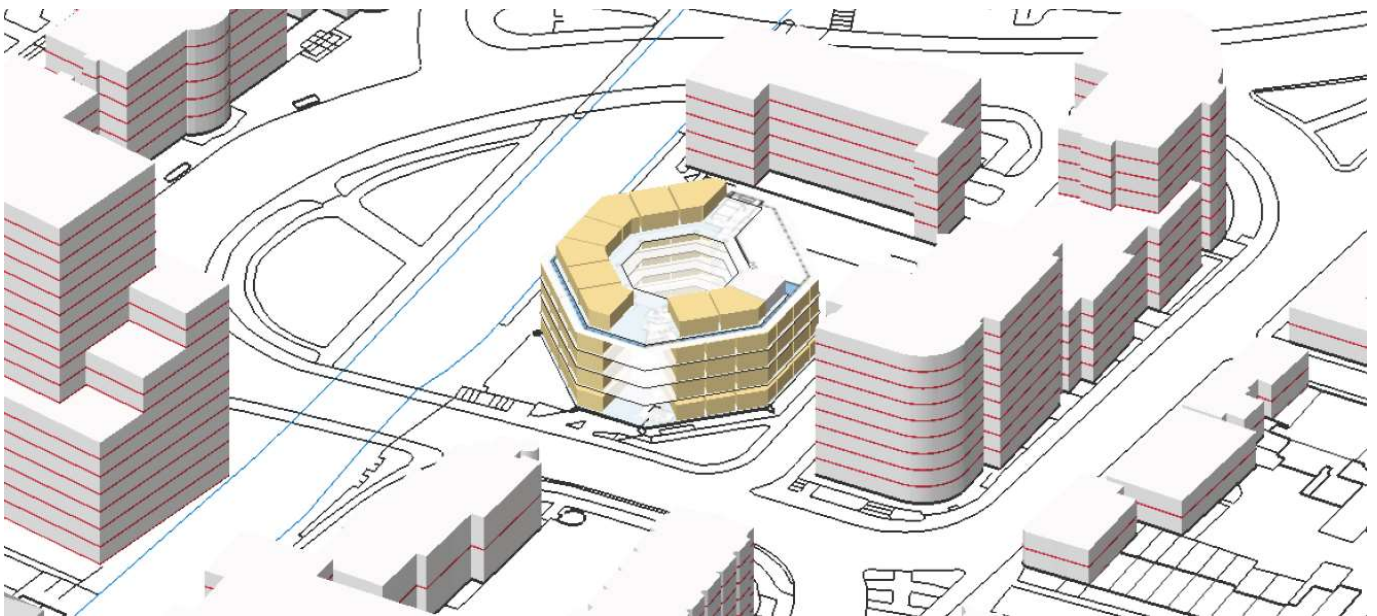


Figure 2: 3D Layout of development including nearby buildings

2.4 Figure 3 below shows an indicative layout of the apartments on a typical floor level that will be built inside the existing building.

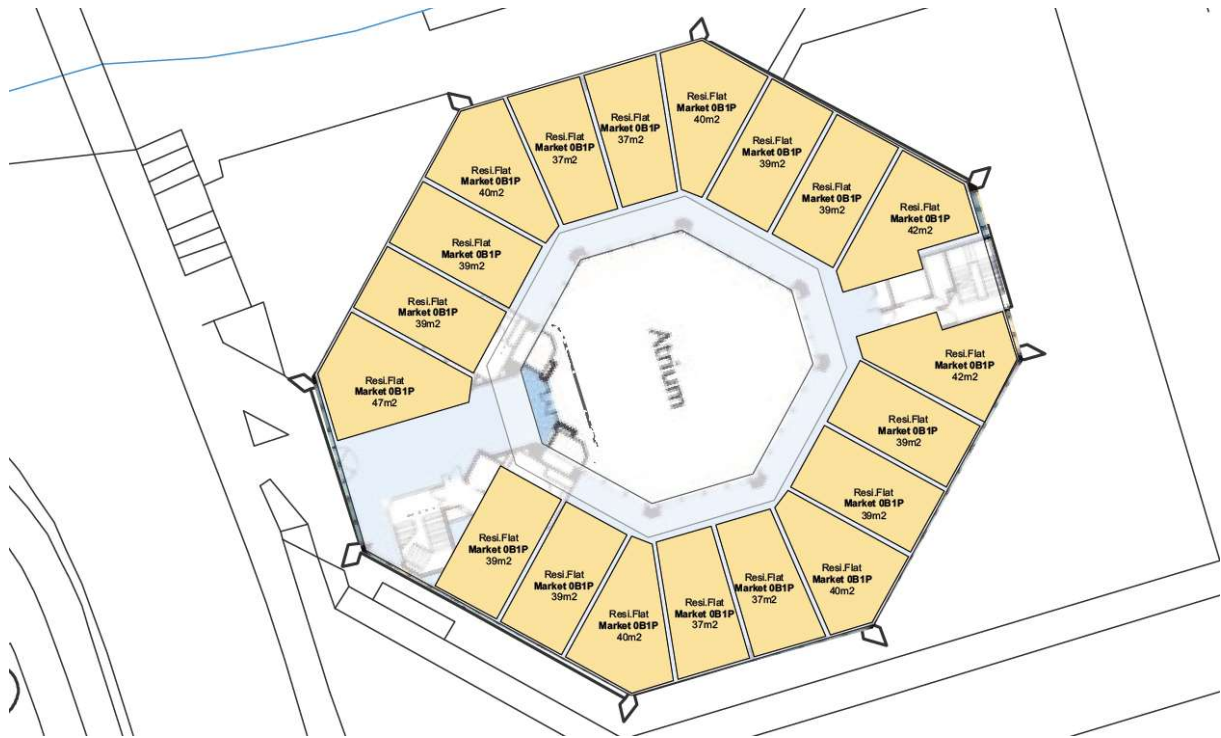


Figure 3: Indicative layout of residential flats inside Sapphire Plaza

3.0 PLANNING POLICIES

3.1 Class O of Schedule 2, Part 3 of the General Permitted Development Order 2015 (GPDO) permits the change of use of a building and any land within its curtilage from Use Class B1(a) offices to Use Class C3 dwelling houses.

3.2 A change of use under Class O is conditional upon the developer first applying to the local planning authority (LPA) for a prior approval determination, i.e., whether the prior approval of the LPA will be required as to:

- transport and highway impacts of the development;
- contamination risks on the site;
- flooding risks on the site; and
- impacts of noise from commercial premises on the intended occupiers of the development.



- 3.3 The prior approval determination is not the determination of a planning application and is a decision on the specified matters only and the LPA is not able to take into account other considerations that would normally apply.
- 3.4 The grant of prior approval can be granted on an unconditional basis or with conditions, which must relate to the matters listed in paragraph 3.2. An LPA is not at liberty to impose conditions relating to matters outside of those listed above.
- 3.5 It is understood that if new mechanical services plant are proposed, noise emissions from such plant would be subject to planning restrictions by the LPA if the plant are not contained into existing plantrooms or generally inside the existing building. Therefore if it is proposed to install for example heat rejection or air handling plant on the roof top of the existing building in order to serve the residential flats, the plant will be subject to Reading Council's Policy EN17: Noise Generating Equipment which states that:

"Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor".

- 3.6 Similarly, the internal noise environment of the proposed habitable rooms is not subject to review/approval by the LPA. However, the developer has requested for a preliminary review of the impact in order to provide feedback to the detailed design team in relation to constraints, opportunities and design options.

4.0 NEIGHBOURING BUSINESSES

MOBALPA KITCHENS

- 4.1 To the South West of Sapphire Plaza and on the ground floor of the nearby residential building, the showroom of Mobalpa Kitchens is located. This is a business involved with bespoke kitchen designs. The premises are a showroom for the business, and are open during typical retail hours. The showroom is located around 10 metres from Sapphire Plaza and residential premises are located above the unit. It is therefore deemed appropriate to conclude that the proposed residential accommodation in Sapphire Plaza will not be impacted from any noise associated with the operation of this business.



Ben's Restaurant

- 4.2 To the North-East of Sapphire Plaza on the ground floor of the residential development to the East (Royal Court) is a Thai cuisine restaurant called Ben's. The restaurant was closed in around 2006 and has remained shut.
- 4.3 Planning permission was granted a few years ago for a Canalside café near the site of the former Ben's restaurant, however, at the time of writing, no construction has commenced on site.
- 4.4 The Sapphire Plaza building is located around 20 metres from the disused restaurant, and existing residential premises are located at a closer distance. It is therefore deemed appropriate to conclude that the proposed residential accommodation in Sapphire Plaza will not be impacted from any noise associated with the operation of this business.

5975 Reading

- 4.5 The redevelopment of the site to the West of Sapphire Plaza across Watlington Street is for a new residential development called 5975 Reading.

The Lyndhurst

- 4.6 To the South West of the development across Queen's Road is a public house called the Lyndhurst. Its opening hours are only during the daytime (until 11pm) and it is located around 60 metres from Sapphire Plaza. Existing residential premises are located at a closer distance. It is therefore deemed appropriate to conclude that the proposed residential accommodation in Sapphire Plaza will not be impacted from any noise associated with the operation of this business.

Conclusions

- 4.7 A review of the nearby businesses to Sapphire Plaza indicated that the impacts of noise from commercial premises on the intended residential occupiers of the development will not be significant and therefore the local planning authority ought to agree to a prior approval determination in relation to noise constraints (of which there are none).



5.0 INCIDENT NOISE LEVELS

Extrium Noise Maps

5.1 The noise maps produced by Extrium¹ present noise emissions due to road and rail traffic alone at the site. The screen shots below present the predicted road and rail traffic noise levels around the development based on the results of the noise modelling by Extrium.

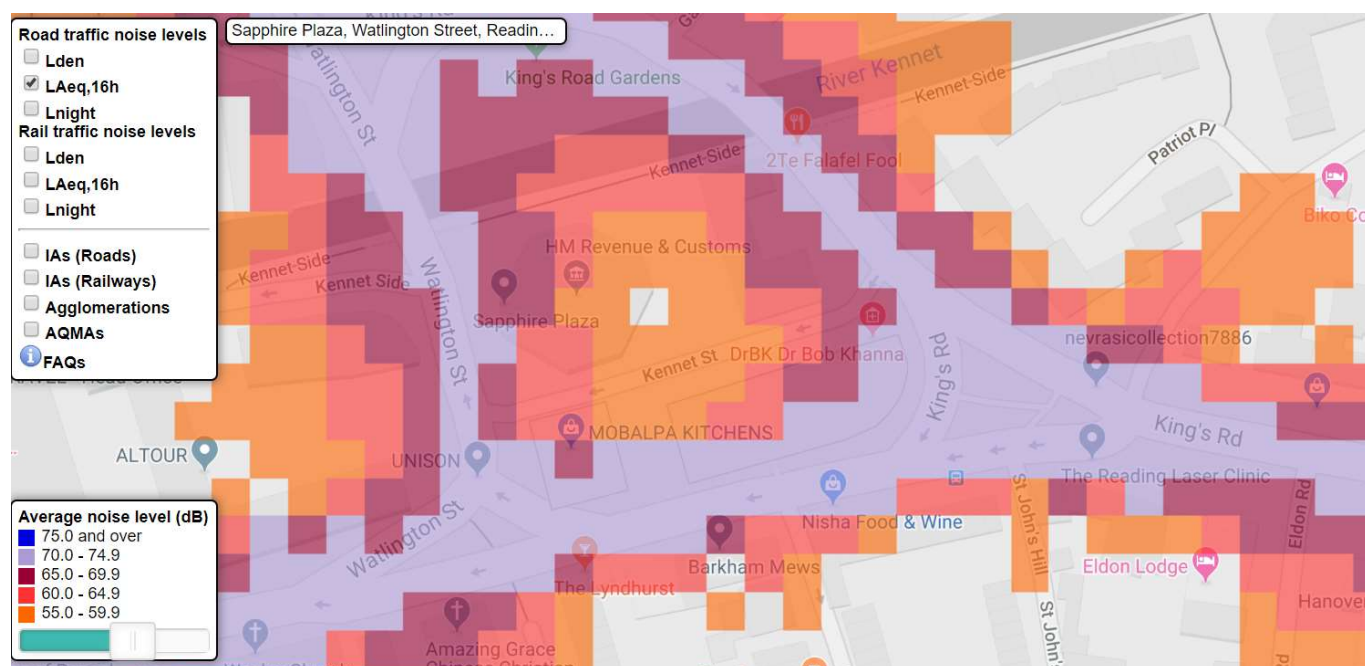


Figure 4. Road noise modelling. Daytime levels

¹ <http://www.extrium.co.uk/noiseviewer.html>



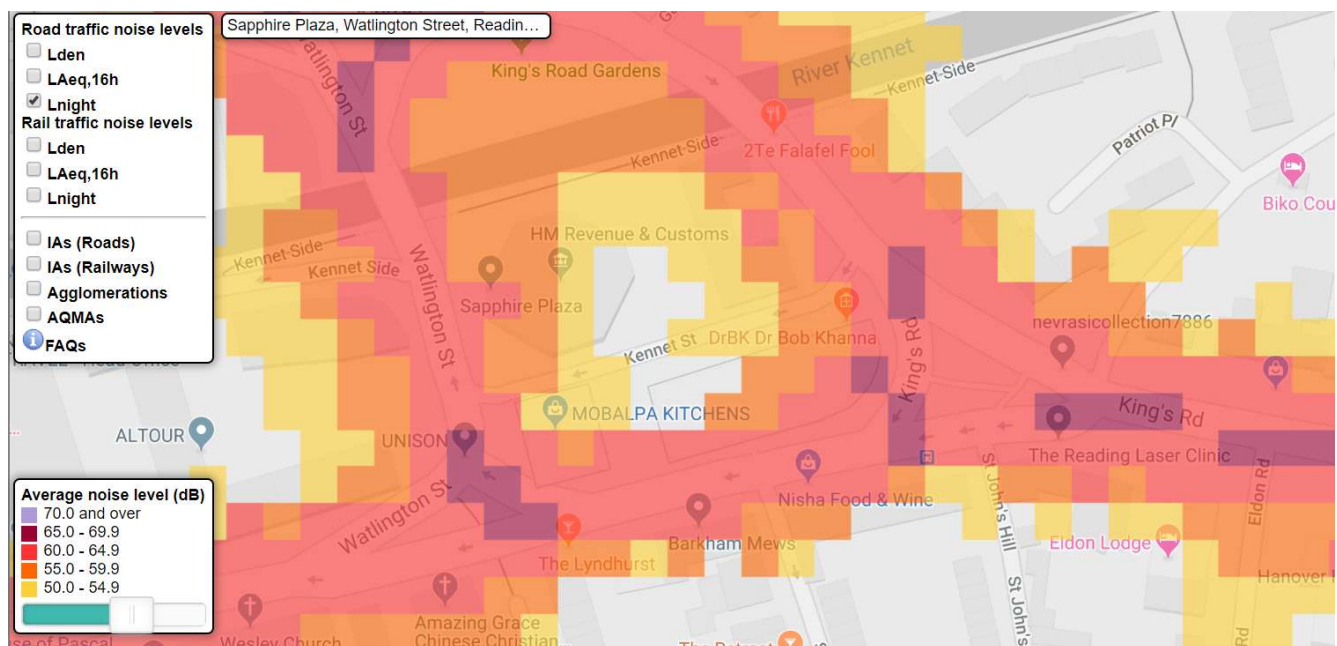


Figure 5. Road noise modelling. Night-time noise levels

5.2 Table 1 below presents the likely worst- and best-case road traffic noise levels around the development based on the results of the computer modelling by Extrium.

Table 1. Likely worst- and best-case road traffic noise levels around the development.

Facade	Free field sound pressure levels (dB)	
	dB L_{Aeq} (16 hours)	dB L_{Aeq} (8 hours)
Highest	65-69.9	60-64.9
Lowest	<55	<50

6.0 ASSESSMENT OF NOISE IMPACT

Assessment target levels

6.1 A review of relevant guidance in relation to suitable internal noise levels is presented in Appendix 1. In general accordance with BS8233:2014, internal noise levels under background ventilation conditions of around 35-40 dB L_{Aeq} , 16 hours during the daytime and 30-35 dB L_{Aeq} , 8 hours during the night-time ought to be considered suitable target levels.

6.2 It is considered that a review of L_{max} internal noise levels is not appropriate for this site, since there are no nearby sources of environmental noise that are normally associated with individual noise events i.e. train or aircraft pass-bys. Individual L_{max} noise levels from normal road traffic is not generally considered adverse (unless the climate is dominated by events like ambulance/police car



sirens). This is consistent with Section 2.2.2. of the World Health Organisation Environmental Guidelines for the European Region and the Note 4 of Section 7.7.2 of BS8233:2014.

Indoor Levels

- 6.3 The composite acoustic performance required of any portion of the building envelope will depend on its location relative to the principal noise sources around the site and the nature of the spaces behind it (noise criteria, size, room finishes, etc.).
- 6.4 Due to the layout, orientation, size, different assessment levels, location and varying noise climate around the building it can be inferred that each façade and probably each window and ventilator (if present) on a façade should have a different sound insulation performance level in order for a specific internal ambient noise level to be reached. Logistically, this could result in increased costs for the development due to bespoke solutions, effects on programme and increase of errors during construction.
- 6.5 Incident traffic noise levels around the development differ.
- 6.6 Due to security issues, we were not able to visit the building and review the sound reduction of the external building fabric. Based on a visual review from outside, it appears that the glazing elements are double glazed. It was noted that only a few openable windows were located along the curtain walling and therefore not all habitable rooms will have access to an openable window.
- 6.7 It is generally accepted that the typical noise reduction achieved by conventional thermal double glazing is 33 dB for road traffic noise. This value is taken from PPG24 (now superseded) and is the difference between values measured outside and inside typical dwellings. However, due to large areas of glazing along the external façade of the building, a more appropriate value of noise reduction would be 30 dB. A simple review of the likely internal noise levels in habitable rooms would be to assess the difference between the likely incident noise levels and the assumed generic sound reduction from the predominantly glazed external building fabric as shown in Table 2.

Table 2. Likely internal noise levels

Facade	Likely internal noise levels (dB)	
	dB L_{Aeq} (16 hours)	dB L_{Aeq} (8 hours)
Highest	35-39.9	30-34.9
Lowest	<25	<20



- 6.8 Based on this generic assessment (Table 2), it appears that generally acceptable internal noise levels can be achieved at the proposed habitable rooms. Additional reductions can also be achieved if required (up to the discretion of the developer) via the use of secondary glazing or if a smaller reduction is required, a reduction of the external glazed area in the habitable room.
- 6.9 The habitable rooms will need to comply with the Building Regulations. This includes Approved Document E (resistance to the passage of sound) and Part F (ventilation in dwellings). If penetrations are placed on the façade in order to ventilate the rooms accordingly, internal noise levels will increase. It is unlikely that trickle ventilators will be retrospectively placed into the existing glazing as this is a highly impractical measure. The air permeability of the building may be high enough for System 3 of Approved Document F to be used (MEV units) without the need for trickle ventilators for fresh air intake. Alternatively, System 4 (MVHR) may be used. It may be impractical to place the fresh air and extract ventilation ductwork along the external building fabric and perhaps it may be more appropriate to connect these into the internal atrium. This design solution would reduce noise break in into the habitable rooms (which may have necessitated the fitting of atmospheric silencers) and also will reduce any plant noise impact to nearby noise sensitive premises.
- 6.10 Since some of the units will not contain opening windows (which can be used for purge ventilation), the developer may consider placing oversized mechanical units (MEV or MVHR) with a boost duty. If required, comfort cooling can be provided via MVHR units with a summer bypass function and there are manufacturers that have brought into the market systems that utilise a tempered fresh air system. These systems add a small amount of cooling to the whole dwelling ventilation supply system (e.g. to the MVHR). This provides a reduced temperature fresh air supply which can provide some cooling to a space. Unlike comfort cooling, these systems are not designed to achieve a specific temperature in a space.

Outdoor Levels

- 6.11 The proposed flats will not contain any private amenity space.

Plant Noise Impact

- 6.12 There are no current proposals for any new building services plant to serve the converted office development. The potential for the inclusion of small fans serving the various flats has been discussed above. It is unlikely that the impact from these items will not meet the policy requirements of the local authority and it is debatable whether these plant noise emissions will require approval



from the local authority since the plant and associated ductwork will, if this option is selected, be contained inside the existing building.

- 6.13 Finch Consulting has recently undertaken a noise survey at a nearby development. Background L_{A90} noise levels were found to be around 50-55 dB during the daytime and around 30-35 dB during the night-time. Taking into consideration these levels, distance attenuation and the potential for screening, it is unlikely that any typical plant (air handling plant, dry air coolers, air source heat pumps) not located within the existing building, will not be able to comply with the typical policy in relation to plant noise impact to nearby noise sensitive premises. It should be noted that conventional noise control measures for these plant are also readily available.

7.0 CONCLUSIONS

- 7.1 The proposed conversion of the existing commercial building called Sapphire Plaza into residential accommodation has been reviewed in relation to acoustics.
- 7.2 A review of the existing businesses that operate around the development has concluded that the proposed residential occupants will not be affected by noise associated with the operation of these businesses.
- 7.3 A preliminary review of the impact from existing road traffic into the proposed habitable rooms has been undertaken and proposals put forward in order for acceptable internal noise levels to be achieved.
- 7.4 A preliminary review of the noise impact from any proposed new building services plant has been undertaken and significant constraints have not been identified.



APPENDIX 1

GUIDANCE DOCUMENTS



BS8233:2014

The guidance set out in BS8233:2014 is closely aligned with WHO and specifically provides guideline limits for noise within internal living spaces and external amenity areas.

Table 4 from BS8233:2014 gives the following internal guideline values:

BS8233:2014 internal guideline levels			
Activity	Location	07:00-23:00	23:00-07:00
Resting	Living Room	35 dB $L_{Aeq, 16hr}$	
Dining	Dining room/area	40 dB $L_{Aeq, 16hr}$	
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16hr}$	30 dB $L_{Aeq, 8hr}$

In certain circumstances a 5 dB relaxation of the limits shown in the table above is considered reasonable in BS8233:2014 note 7:

“Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.”

In BS8233 design limits for noise affecting external amenity areas is given as 50 dB $L_{Aeq, T}$ with an upper guideline of 55 dB $L_{Aeq, T}$. It is further noted that in areas where achieving these levels is deemed to be not realistically feasible (e.g. city centres or urban areas adjoining a strategic transportation network) developments should be designed to achieve the lowest practicable levels in these amenity areas.

In Section 7.7.3.2 of BS8233:2014, Design Criteria for External Use, it is noted that in developments such as flats and apartment blocks *“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”*.

Ventilation Requirements for Habitable Rooms

Background Ventilation

Three types of ventilation are required under Part F. Whole building ventilation provides nominally continuous air exchange that may be reduced or ceased when the building is not occupied. It can be provided via background ventilators operating alone, or together with:

- passive stack ventilators;
- continuous mechanical extract; or
- continuous mechanical supply and extract with heat recovery.



Extract ventilation is applicable to rooms where most water vapour and/or pollutants are released (e.g. kitchens and bathrooms). It can be provided by intermittent fans, passive stack or continuous mechanical extract with or without mechanical supply and heat recovery.

The four systems described in Part F do not present solutions that utilise the use of opening windows for background ventilation. Opening windows do not provide a controllable means of ventilation and also pose security risks. Therefore, it is not possible to offer to the market a residential dwelling that utilises opening² windows for background ventilation.

Purge Ventilation

Purge ventilation is required throughout the building to aid the removal of high concentrations of pollutants and water vapour. It is commonly provided simply by opening windows and doors. Even though purge ventilation is recommended via opening windows, the temporary and intermittent occurrence of this does not normally result in an unacceptable increase of internal noise levels. Part F goes on to say³ that "*Purge ventilation provisions may also be used to improve thermal comfort, although this is not controlled under the Building Regulations.*"

Summary in Relation to Ventilation

In summary, background ventilation for new residential dwellings should be provided via one of the four systems in Approved Document F. The composite external building fabric should be designed to ensure that appropriate internal noise levels due to external incident noise are met during background ventilation. This can be secured via a planning condition if deemed necessary.

Purge ventilation for residential dwellings should be provided via open windows. The slight increase of internal noise levels should be considered acceptable.

ProPG : Planning and Noise : 2017

The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise. It is applicable to noise from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that is "not dominant".

² Meaning without any restrictions on opening size

³ Paragraph 4.15 in Approved Document F



This ProPG advocates a systematic, proportionate, risk based, 2-stage approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites and assists proper consideration of noise issues where the acoustic environment is challenging.

The two sequential stages of the overall approach are:

- Stage 1 - an initial noise risk assessment of the proposed development site: and
- Stage 2 - a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1 - demonstrating a "Good Acoustic Design Process";
- Element 2 - observing internal "Noise Level Guidelines";
- Element 3 - undertaking an "External Amenity Area Noise Assessment"; and
- Element 4 - consideration of "Other Relevant Issues".

The ProPG considers suitable guidance on internal noise levels found in "BS8233:2014: Guidance on sound insulation and noise reduction for buildings". Table 4 in Section 7.7.2 of the standard suggests that "in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values". The standard states (Section 7.7.1) that occupants are usually more tolerant of noise without a specific character" and only noise without such character is considered in Table 4 of the standard.

NOTE 1 the Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure born and airborne noise sources. Ground borne noise is assessed separately and is not included as part of these targets, as human response to ground borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table (Table 4 of BS8223) are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's eve.

NOTE 4 Regulation individual noise events (for example, scheduled aircraft or passing trains) can cause steep disturbance. A guideline value may be set in terms of SEL or $L_{Amax, F}$ depending on the character and number of events per night. Sporadic noise events could require separate values in most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events to not normally exceed 45 dB $L_{Amax, F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet



internal target levels with windows open, internal noise levels can be assessed with windows closed, however, any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms tested has been kept to a minimum. Once internal L_{Aeq} exceed the target levels by more than 10 dB, they are likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (See Section 3.D).



APPENDIX 2

GLOSSARY



GLOSSARY OF TERMS

Decibels

It is convenient when quantities have a large range to express them in decibel units. The decibel (dB) is a relative unit, showing how much larger or smaller the quantity is relative to a reference value, which is defined as zero on the decibel scale. Decibels are intended to make a large range more readily comprehensible.

A quantity expressed in decibels is commonly called a 'level'.

Many quantities in acoustics are expressed in decibels (see below).

Frequency Weightings

Sounds that would be measured as equal by a sound measuring instrument may not sound equally loud to a human listener, depending on their character, particularly the frequency content (pitch).

Various 'frequency weightings' have been developed that can be used to modify the measured sound in order to produce a value that more closely corresponds to perceived loudness.

One such frequency weighting, the 'A' weighting, has become almost universally used in assessing the effect of prolonged exposure to noise on human health, and features in most Regulations, guidelines and Standards in this area.

A different frequency weighting, the 'C' weighting, has in a similar way become standardised for the measurement and assessment of short-duration sounds for their effect on human health. The 'C' weighting is also used in some methods for assessing the performance of hearing protection.

A sound that has been measured with the 'A' weighting applied is commonly referred to as 'A-weighted'. Similarly, one will see 'C-weighted' where the 'C' weighting has been applied.

Note that sometimes a sound pressure level that has been measured with the 'A-weighting' or 'C-weighting' applied can be found expressed in units of 'dB(A)' or 'dB(C)'. This nomenclature is no longer standard practice.



Quantities and Symbols

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20 \mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_A	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) that differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $LA_{10,18h}$ is the A-weighted arithmetic average of the 18 hourly $LA_{10,1h}$ values from 06:00-24:00.

