RESIDENTIAL DEVELOPMENT
TAVISTOCK HOUSE
ROCKINGHAM ROAD, UXBRIDGE

NOISE ASSESSMENT

DECEMBER 2016



the journey is the reward

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NOISE ASSESSMENT

DECEMBER 2016

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Issue Date:	**December 2016**
Status:	**FINAL**

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Proposed Residential Development
Tavistock House, Rockingham Road, Uxbridge
Noise Assessment
December 2016

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1 Introduction

1.1 Mayer Brown Ltd has been instructed by STA Associates to prepare this Noise Assessment, which accompanies a planning application for the conversion of the existing roof space of Tavistock House to provide four apartments and changes to the external appearance of the entire building.

1.2 The scope of this Noise Assessment is structured as follows:

- **Section 2** describes the location of the site in relation to the existing transport infrastructure and neighbouring land uses.
- **Section 3** outlines the development proposals.
- **Section 4** discusses national and local planning policy and 'industry standard' design guidance relevant to noise.
- **Section 5** presents the results of environmental noise monitoring at the site to determine existing noise levels.
- **Section 6** sets out mitigation that will be implemented within the scheme design to control noise intrusion into the proposed flats;
- **Section 7** considers the provision of external amenity space;
- Conclusions are presented in **Section 8**.

A glossary of the acoustic terminology and nomenclature used in this report is presented at **Appendix A**.

2 Site Location

2.1 The location of the proposed development in relation to the local highway network is shown in **Figure 2.1** below:

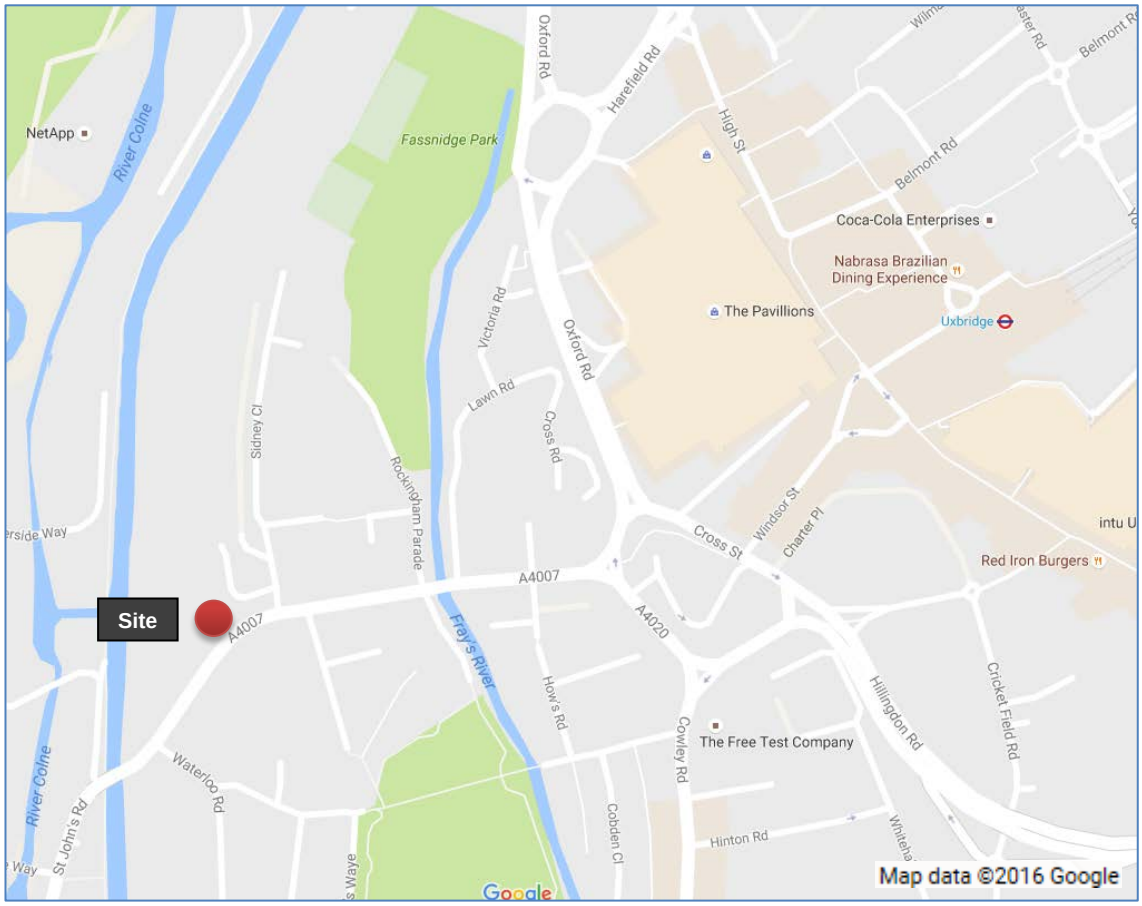


Figure 2.1: Site in Relation to the Local Highway Network

2.2 The site is located on the north side of Rockingham Road (A4007), just east of its junction with Waterloo Road, and approximately 500m directly west of Uxbridge town centre and 750m southwest of Uxbridge Underground Station. The River Colne is located to the west and Fray's River is located to the east of the site

2.3 The existing building at the site currently provides Use Class B1 (office) accommodation, and was recently granted "Prior Approval" consent under the *"Town and Country Planning (General Permitted Development) (England) (Amendment) Order 2016"* for its change of use to Use Class A3 (residential).

2.4 The more detailed general arrangement of the site and adjoining land uses is shown in **Figure 2.2** below:



Figure 2.2: Site Location

2.5 To the north, the site is bounded by Rockingham Wharf which provides access to a number of light industrial units, including a sign writer, a light engineering workshop and a joinery workshop.

2.6 To the east, the site overlooks Rockingham Road, on the far side of which is St Mary's Catholic Primary School, a commercial unit at 69 Rockingham Road and a residential terrace of two storey properties to the south.

2.7 The south-western boundary of the site is formed with Sheraton House, a three storey block of flats, to the south of which is a public house (The Dolphin).

2.8 To the west, the site adjoins Dolphin Wharf, which is formed by two light industrial units currently in occupation by a lift engineering company and home automation engineering company.

3 Proposed Development

3.1 The application seeks the conversion of the existing roof space of the building to provide four additional flats. The proposed general arrangement of the roof space is shown in **Figure 3.1** below:

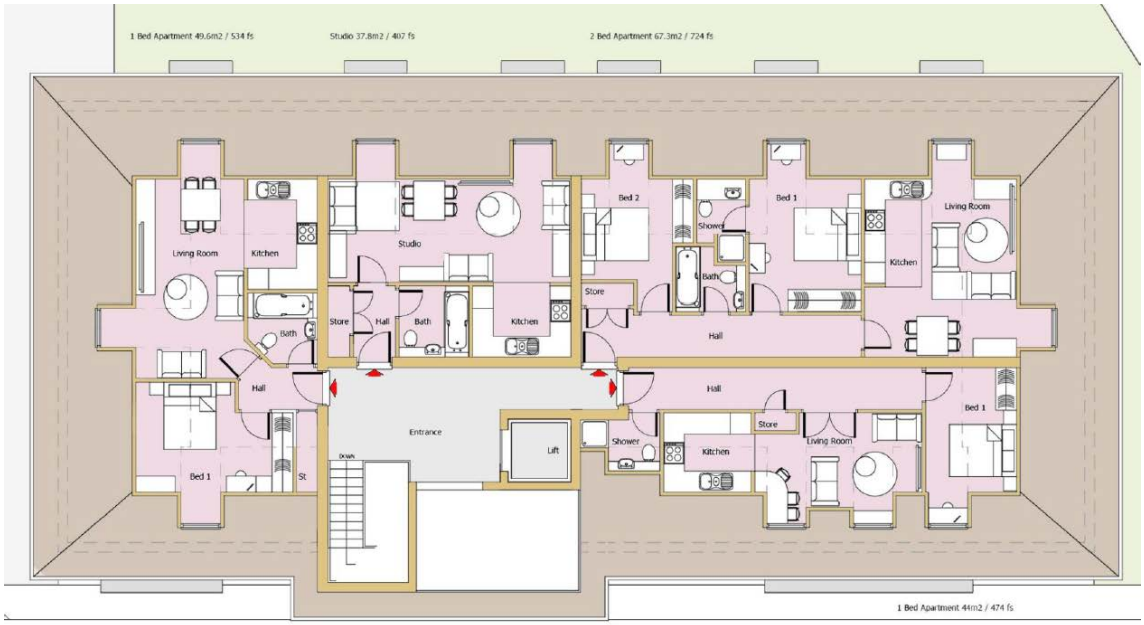


Figure 3.1: Proposed Provision of Residential Space within Existing Roof Space

3.2 The application also seeks the external changes to the entire building to provide a more residential appearance to the building. This is to be achieved through the use of new horizontal cladding to conceal the over-stated existing coursing of brickwork; well-proportioned dormer windows for the new flats within the roof space and new balconies which will provide external amenity space for the apartments and assist in providing an aesthetic articulation of the general external appearance of the building.

3.3 The proposed external changes are shown in **Figures 3.2** and **3.3** below:



Figure 3.2: Proposed Front Elevation (Overlooking Rockingham Road)



Figure 3.3: Proposed Rear (North Elevation)



Figure 3.4: Proposed Flank (East and West) Elevations

4 Planning Policy Context and Legislative Background

National Planning Policy

National Planning Policy Framework, (NPPF, 2012)

4.1 Current governmental guidance for the determination of planning applications is given in the *"National Planning Policy Framework"* (NPPF).

4.2 Paragraph 109 of the NPPF advises:

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

4.3 With specific regard to noise, paragraph 123 of the NPPF states:

> *"Planning policies and decisions should aim to:*
>
> - *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
> - *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
> - *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put 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."*

4.4 With regard to the 'adverse impacts' referred to in the first two of the above bullet points, the NPPF directs the reader to the advice contained in DEFRA's *"Noise Policy Statement for England"* (NPSE). This Policy Statement introduces the concept of a *"Significant*

Observed Adverse Effect Level" (SOAEL), *"Lowest Observed Adverse Effect Level"* (LOAEL) and *"No Observed Adverse Effect Level"* (NOAEL). These are concepts aligned with toxicology outcomes derived from guidance given by the World Health Organisation.

Noise Policy Statement for England

4.5 Whilst the intent of the NPSE in relation to the NPPF is clear, the NPSE does not, at this time, provide any quantitative threshold values for each identified level of *"effect"*. Indeed, the NPSE carefully highlights that:

> *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

National Planning Practice Guidance

4.6 The application of national planning is amplified in the governments *"National Planning Practice Guidance"* (NPPG). This seeks to help clarify understanding the perception of noise effects, outcomes and actions that should be taken to align decision making with the NPPF. In line with the NPPF concept of basing decision making on the identification of "significant" or "other" impacts on health and quality of life, the NPPG aligns its guidance with the NPSE.

4.7 The table below summarises this guidance:

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	**No specific measures required**
No Observed Adverse Effect Level (NOAEL)			
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	**No specific measures required**
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	**Mitigate and reduce to a minimum**
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	**Avoid**
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	**Prevent**

Table 4.1: NPSE Guidance

4.8 Whilst the NPPF and associated planning practice guidance sets out stringent imperatives to ensure the satisfactory development of land in relation to possible noise impacts, this policy and guidance does not generally provide any detailed technical guidance defining what may be considered to constitute a *"significant"* or *"other"* adverse impact. In the absence of such technical guidance, reference needs to be made to sustainable development standards set out in local policy and/or relevant 'industry standard' guidance.

Regional Planning Policy

4.9 The following regional planning policy applies to the site:

The London Plan[1]

4.10 The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years.

4.11 In Chapter 3 – London's People, paragraph 3.11 states the following:

> *"Housing has a major impact on the health of residents, and the policies in this Plan are intended to enable Londoners to live in well designed, high quality homes, appropriately sized and energy efficient, warm and dry, safe, providing good access to high quality social infrastructure, green spaces, and limiting disturbance from noise…"*

4.12 Policy 5.3, Sustainable design and construction states:

> *"Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:*
>
> *… minimising pollution (including noise, air and urban run-off)"*

4.13 Chapter 7 – London's Living Spaces and Places, paragraph 7.18, states the following:

[1] The Greater London Authority (GLA) (2015) The London Plan. Spatial development strategy for London. Consolidated with alterations since 2011. GLA, London.

"The effects of traffic can have a significant impact on the quality of the public realm in terms of air quality, noise and amenity of a space. The negative effects of traffic should be minimised to ensure people's enjoyment of public realm is maximised."

4.14 Policy 7.15 – Reducing and managing noise, improving and enhancing the acoustic environment and promoting appropriate soundscapes states that:

*"**Strategic***

A).The transport, spatial and design policies of this plan will be implemented in order to reduce noise and support the objectives of the Mayor's Ambient Noise Strategy.

Planning decisions

B. Development proposals should seek to reduce noise by:

a) avoiding significant adverse noise impacts on health and quality of life as a result of new development;

b) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;

c) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);

d) separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;

e) where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;

f) having particular regard to the impact of aviation noise on noise sensitive development;

g) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

LDF preparation

C. Boroughs and others with relevant responsibilities should have policies to:

a) manage the impact of noise through the spatial distribution of noise making and noise sensitive uses;

b) identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations"

Greater London Authority Ambient Noise Strategy[2]

4.15 The Greater London Authority Ambient Noise Strategy considers a wide range of issues relating to noise which may affect this particular development. These include noise from transportation sources, known as ambient noise, and construction activities, which are described as neighbourhood noise.

4.16 The general objectives are identified as minimising the adverse impacts of road traffic noise and improving noise environments in London's neighbourhoods, especially for housing, schools, hospitals and other noise sensitive uses.

4.17 The strategy states the following policies for urban noise sensitive development:

"Policy 69

The London Plan, 2004 (Policy 4A.14) states that the Mayor will and boroughs should reduce noise by:

- *Minimising the existing and potential adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
- *Separating new noise sensitive development from major noise sources wherever practicable;*
- *Supporting new technologies and improved practices to reduce noise at source, especially in road, rail and air transport;*
- *Reducing the impact of traffic noise through highway management and transport policies;*
- *Containing noise from late night entertainment and other 24-hour activities, and where appropriate promoting well-managed designated locations."*

2 Greater London Authority (GLA). (2004).The Mayor's Ambient Noise Strategy. GLA, London.

"Policy 70

The Mayor will, in strategic referrals which include residential development on sites with noise levels higher than Noise Exposure Category A of Planning Policy Guidance Note 24, or the equivalent level in any revision of guidance, seek specific evidence on the action to be taken to address noise."

Local Planning Policy

4.18 The London Borough of Hillingdon's Development Plan for the borough includes:

- The Hillingdon Local Plan: Part 1- Strategic Policies; and
- The extant 2007 Saved Unitary Development Plan policies adopted as the Hillingdon Local Plan: Part Two

4.19 Policies relevant to noise adopted in the above documents include:

Policy EM8: Land, Water, Air and Noise

(…) Noise

The Council will investigate Hillingdon's target areas identified in the Defra Noise Action

Plans, promote the maximum possible reduction in noise levels and will minimise the number of people potentially affected.

The Council will seek to identify and protect Quiet Areas in accordance with Government

Policy on sustainable development and other Local Plan policies.

The Council will seek to ensure that noise sensitive development and noise generating development are only permitted if noise impacts can be adequately controlled and mitigated.(…)"

Strategic Objective SO10:

Improve and protect air and water quality, reduce adverse impacts from noise

including the safeguarding of quiet areas and reduce the impacts of contaminated land.

Policy DME 1: Employment Uses on Designated Employment Sites

….

E) Development adjacent to SILs, LSIS and LSELs must be located and/or designed so as to not to compromise the integrity or operation of these employment areas

4.20 The Borough also has an adopted Supplementary Planning Document on noise (adopted 2006).

4.21 With regard to the siting of new residential development, Key Point 1 of the SPD states:

4.5 The following approach to assessing sites according to various categories is derived from the approach set out in Annex 1 of PPG 24 "Planning and Noise" (September 1994). The guidance below takes account of PPG 24 and local circumstances.

4.6 When assessing a proposal for residential development subject to transport related noise, the Local Planning Authority will use Table 1 to determine which of the four Noise Exposure Categories (NECs) A to D the proposed development site falls, taking account of both day and night-time noise levels. Values in Table 1 refer to average noise levels determined for an open site at the position of the proposed dwellings, well away from any existing buildings. Noise levels should be determined at a height of 1.2m to 1.5m above ground at the position of the proposed dwellings, and also at upper or lower floor levels if significant differences in noise exposure are found at the various proposed floor levels. Where the average falls on the boundary between NECs B and C, it will be for the local planning authority to determine the more appropriate NEC for the proposal. Where sites are affected by existing buildings, bunds or screens, specific advice should be sought from the Council's Environmental Protection Unit.

TABLE 1: NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES

Noise Exposure Categories	Times (hrs)	$L_{Aeq,T\ dB}$ Road	$L_{Aeq,T\ dB}$ Rail	$L_{Aeq,T\ dB}$ Aircraft	Mixed Sources $L_{Aeq,T\ dB}$	Advice
A	07:00 – 23:00 23:00 – 07:00	< 55 < 45	< 55 < 45	< 57 < 48	< 55 < 45	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	07:00 – 23:00 23:00 – 07:00	55 – 63 45 – 57	55 – 66 45 – 59	57 – 66 48 – 57	55 – 63 45 – 57	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise to meet the Council's recommended outdoor and indoor noise levels.
C	07:00 – 23:00 23:00 – 07:00	63 – 72 57 – 66	66 – 74 59 – 66	66 – 72 57 – 66	63 – 72 57 – 66	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise to meet the Council's recommended outdoor and indoor noise levels.
D	07:00 – 23:00 23:00 – 07:00	> 72 > 66	> 74 > 66	> 72 > 66	> 72 > 66	Planning permission should normally be refused.

Source: Derived from PPG24, 1994

Note:

(i) Values in the above table refer to noise levels at the position of the proposed dwelling.

(ii) The noise levels used should be representative of typical conditions. This may include predictions of noise. This could include predictions about various operating conditions but also the effect of proposed buildings adjoining the site.

(iii) Sites where night time noise events (23.00 - 07.00) regularly exceed 82 dB$L_{Amax,Slow}$, several times in any hour should be treated as being in category C (except where the L_{Aeq} level already puts the site in category D).

(iv) For aircraft noise, daytime values accord with contour values which relate to levels measured 1.2m above ground.

(v) $L_{Aeq,T}$ the equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T).

(vi) $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

4.7 The Local Planning Authority will have regard to the advice in Table 1 for the appropriate noise exposure category. These levels will be used in any initial discussions. In applying the standards in Table 1 the dominant noise source should be determined. To check if any individual noise source is dominant the noise level from individual sources should be determined and then combined by decibel addition. If the level of any one source lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the mixed source NECs. If the site is affected by industrial noise then special considerations will apply. Further guidance is given in Key Point 6.

4.8 Further detailed residential noise standards are given in Table 2: Residential Noise Criteria (see section 5) and refer to predicted noise levels for the development following any mitigation measures, such as those outlined in Key Point 10.

4.9 The noise exposure categories values for mixed sources refer to where there is no dominant noise source. Noise effects from mixed sources could combine in a way that increases their overall effect. Sites adversely affected by a number of sources will need an assessment of combined impacts. Specific advice should be sought from the Council's Environmental Protection Unit. If the site is affected by industrial noise or noise with particularly annoying features and characteristics then special considerations will apply. Regard should be given to the characteristics of the noise source involved in each case. Further guidance is given in Key Point 6.

4.22 "Key Point 6" deals with noise from industrial uses and recommends that the potential impacts are assessed in line with the guidance of BS 4142: 1997: *"Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas"*. It should be noted that this standard is now superseded by BS 4142: 2014: *"Methods for Rating and Assessing Industrial and Commercial Sound"* to provide a closer alignment with the principles of national planning policy (NPPF, NPSE)

4.23 With regard to technical design standards for residential development, Table 2 of the SPD provides the following design guidance:

TABLE 2: RESIDENTIAL NOISE CRITERIA

		Recommended Noise Level (dB)
Daytime Noise (07:00 - 23:00)	Outdoor living areas	As low as practicable, and < 50 $L_{Aeq,T}$ *(free field)
	Indoor living areas	< 35 $L_{Aeq,T}$*
Night-time Noise (23:00 - 07:00)	Outside bedroom windows	< 45 $L_{Aeq,T}$ *(façade) < 60 $L_{Amax,Fast}$ (façade)
	Inside bedrooms	< 30 $L_{Aeq,T}$* < 45 $L_{Amax,Fast}$

Source: Derived from BS8233:1999 and "Guidelines for Community Noise", World Health Organisation, 1999
* Time base T should be appropriate for the circumstances, typically 1 hour day and 5 minutes night

Design Guidance

BS 8233: 2014; "Sound Insulation and Noise Reduction for Buildings

4.24 BS 8233: 2014 *"Sound Insulation and Noise Reduction for Buildings"* offers the following design guidance for indoor ambient noise levels within dwellings:

Activity	Location	07.00 to 23.00 hours	23.00 t0 07.00 hours
Resting	Living Room	35dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$

Table 4.2: BS 8233 Indoor Ambient Noise Level Design Guidance

4.25 A note accompanying the above Table states:

> *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep 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."*

4.26 Despite identifying that maximum values *'may'* be set, guidance values for differing types of noise/frequency of events is not given. It can, however, be noted that the recommendations of BS8233 are aligned with guidance set out in the World Health Organisation's *"Guidelines for Community Noise"*. On that basis, it would seem

appropriate to seek to limit night-time noise intrusion such that maximum noise levels do not normally exceed a maximum internal value of 45dB $L_{Amax,fast}$. Section 3.4 of the WHO guidelines implies that *'not normally'* would be an occurrence of more than 10-15 times per night.

4.27 A further note to the above Table indicates that where *"development is considered necessary or desirable"*, the above guideline values can be relaxed by 5dB and *"reasonable"* internal conditions still be achieved.

BS 4142: 2014: "Methods for Rating and Assessing Industrial and Commercial Sound"

4.28 BS 4142 provide a rating and assessment methodology for assessing the potential adverse impact of industrial and commercial noise sources on neighbouring dwellings.

4.29 The assessment procedure initially compares the ***'Rating Level'*** of the source with the '***Background Noise Level'*** when the source is not present.

4.30 The ***'Rating Level'*** (L_{Ar}) referred to is the specific noise level of the noise source under investigation (in terms of the L_{Aeq} noise index), to which corrections are applied if the noise has certain audible characteristics. **Table 5.1** below summarises the corrections to be applied based on a subjective assessment of noise source characteristics.

Character Correction				
Feature / Perception	**Tonality**	**Impulsivity**	**Intermittency**	**Other acoustic characteristics**
Just Perceptible	+2dB	+3dB	When the specific sound has identifiable On/Off conditions that are readily distinctive. +3dB	+3dB
Clearly Perceptible	+4dB	+6dB		
Highly Perceptible	+6dB	+9dB		

Table 4.3: BS4142 Character Correction for Rating Level Calculation

4.31 The ***'Background Noise Level'*** (L_{A90}) represents the noise level that is exceeded for 90% of the stated measurement period. For assessment purposes, the background noise level needs to be determined without the noise source under investigation operating.

4.32 The time of operation needs to be taken into account. During the day (normally taken to be 07.00 to 23.00 hours) a one hour measurement period is considered appropriate.

During the night (normally taken to be 23.00 – 07.00 hours) a 15 minute time period is normally used.

4.33 The following guidance is then offered based on the outcome of this initial assessment:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4.34 A note accompanying the above guidance states:

> *"Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

4.35 The initial estimate of the impact should then be modified to account for its context. Such considerations include:

- The absolute level of the sound - the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
- Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

- The character and level of the residual sound compared to the character and level of the specific sound.

- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

5 Existing Noise Environment

Automated Noise Monitoring

Noise Monitoring

5.1 An environmental noise survey of the site has been undertaken to determine existing noise levels characterising the site. Due to security concerns at the site, it was not possible to install automated noise monitoring equipment, therefore the survey was undertaken using manned measurement instrumentation. The presence of the surveyor also enabled detailed commentary on noise source influencing measurements to be clearly identified.

5.2 The survey was undertaken between monitoring was undertaken between approximately 08.15 to 15.30 hours on 7 September 2016.

Automated noise monitoring equipment was installed at two locations as described in **Table 5.1** and shown in **Figure 5.1** below.

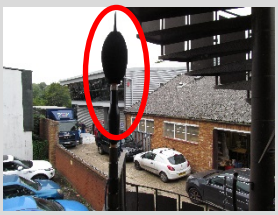
Monitoring Location	Description	Photograph
1	Overlooking Rockingham Road. The measurement was positioned approximately 1m from the front façade of the existing building, by means of a boom pole extended to approximately 1st floor level.	
2	Overlooking industrial units in Rockingham Wharf. The measurement microphone was positioned approximately 1m from the rear elevation of the building, mounted on a boom pole strapped to the external fire escape at 1st floor level.	

Table 5.1: Automated Noise Survey Locations

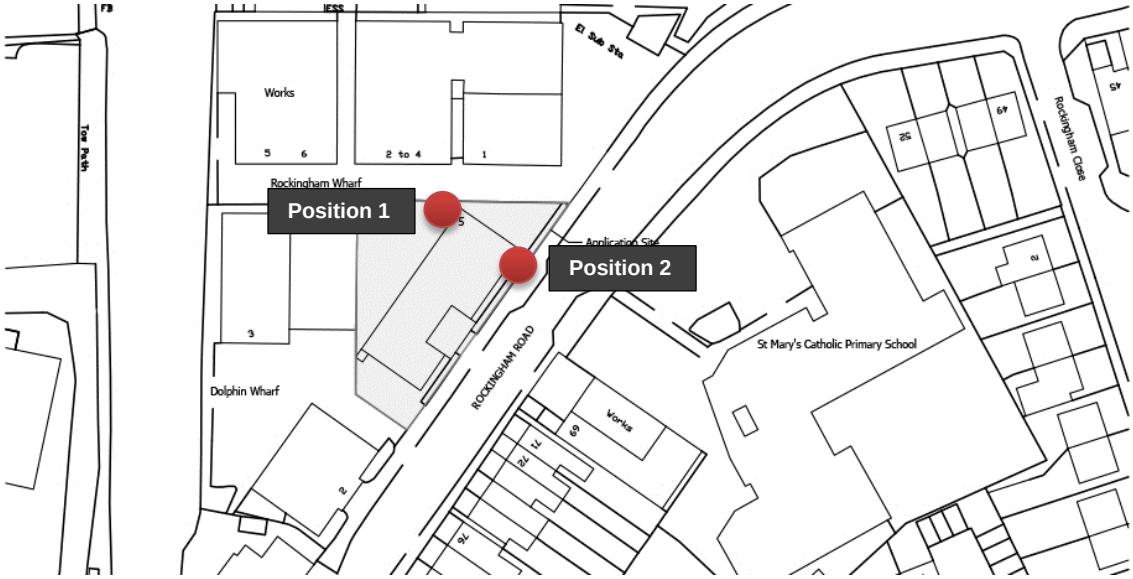


Figure 5.1: Noise Survey Measurement Locations

5.3 The following instrumentation was used for the surveys:

Position	Description	Make	Model	S/No.	Calibration
1	Sound Level Analyser	Norsonic	Nor140	1405946	24/03/2016
	Microphone	Norsonic	Nor1225	41489	
	Preamplifier	Norsonic	Nor1209	15799	
	Outdoor Microphone Kit	Norsonic	Nor 1217	12175120	n/a
2	Sound Level Analyser	Norsonic	Nor140	1405948	24/03/2016
	Microphone	Norsonic	Nor1225	208221	
	Preamplifier	Norsonic	Nor1209	15806	
	Outdoor Microphone Kit	Norsonic	Nor 1217	12175120	n/a
1 & 2	Calibrator	Norsonic	Nor 1251	34058	24/03/2016

Table 5.2: Instrumentation Details

5.4 The sound level analysers were calibrated prior to the survey and the calibration was checked upon completion. No drift in calibration was observed.

Survey Procedure

5.5 The sound level analysers were both configured to record the L_{A90}, $L_{Aeq,}$ and $L_{Amax,fast}$ sound levels over consecutive 1 second periods to provide a detailed time history profile showing fluctuations in noise levels. The analysers were also configured to make real-time contemporaneous audio recordings to assist in identifying the source of specific higher magnitude noise "events" observed in the time history profiling.

Noise Monitoring Results

5.6 Noise levels measured at Positions 1 and 2 are presented on **Time History Graphs 1** and **2** attached at **Appendix B**.

Weather

5.7 Weather conditions during the survey were suitable for undertaken environmental noise measurements being sunny with a temperature of 20-25°C, a light south-easterly breeze (<5m/s) and no precipitation.

Observations and Discussion

5.8 Noise levels at Position 1 were dominated by road traffic noise associated with vehicle movements on Rockingham Road. No other sources of commercial noise were observed to have any significant effect on measured noise levels.

5.9 Noise levels at Position 2 were also influenced by noise from Rockingham Road (albeit acoustically screened by the massing of the building), but were more generally dominated by noise from building services installations (condenser units) associated with the current commercial occupation of the building. Noise from a joinery workshop in Rockingham Wharf was intermittently audible.

6 Site Suitability

6.1 As noted above, the London Borough of Hillingdon's adopted supplementary planning guidance on noise guidance on noise advocates that the suitability of a site for residential development should be determined based on the "Noise Exposure Category" of the site in line with legacy guidance of PPG24.

6.2 The measurements made at Position 1 have been processed to determine typical daytime ($L_{Aeq,16hour}$) and night-time ($L_{Aeq,8hour}$) values, in line with the conversion methodology set out in TRL publication *"Converting the UK Traffic Noise Index $L_{A10,18hour}$ to EU Noise Indices for Noise Mapping"*. Values of 67.1dB $L_{Aeq,16hour}$ and 63.4 dB $L_{Aeq,8hour}$ are calculated [3]. The measurement data also indicates that it is unlikely that night-time noise levels would normally exceed a value of 82dB $L_{Amax,slow}$.

6.3 The above values would place the site in NEC C for both daytime and night-time noise.

6.4 The advice given in SPG 10 for sites falling into NEC C is that:

> *"Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise to meet the Council's recommended outdoor and indoor noise levels".*

6.5 It is therefore concluded that, subject to appropriate mitigation, the site is suitable for residential development.

[3] These values include a correction of 3dB to account for measurements being made 1m from the façade of the building to convert to "free-field" values for comparison with Hillingdon SPD requirements.

7 Mitigation

Design Guidance

7.1 In order to ensure a good standard of residential amenity within dwellings, BS 8233: 2014 and local planning policy recommend that daytime noise levels should be below 35dB $L_{Aeq,16hour}$ and night-time values in bedrooms should be below 30dB $L_{Aeq,8hour}$. These values are considered to represent a LOAEL, in line with national planning policy guidance.

Preliminary Review of Sound Insulation Requirements

7.2 It is generally accepted that a partially open window should maintain an outside to inside sound reduction of around 15dB(A). It is therefore clear that in order to maintain a daytime internal sound level of 35dB $L_{Aeq,16hour}$ promoted on BS 8233: 2014 with conventional openable windows, the external noise environment would generally need to be lower than 50dB $L_{Aeq,16hour}$. As indicated above, the noise levels characterising the site are generally higher than this value. It follows that additional acoustic protection for dwellings is likely to be required, rather than adopting a conventional openable window strategy.

7.3 Whilst PPG 24 has been formally withdrawn and superseded by the NPPF, the former guidance also contains a substantial amount of technical guidance that provides useful context when considering the feasibility of mitigating noise from external sources. In particular, Annex 6 of PPG 24 provides technical advice with regard to the typical “outside-to-inside” noise reduction that can expected for various types of noise.

7.4 For road traffic noise, this guidance indicates that double glazing would typically offer an outside to inside sound reduction of around 33dB(A). This would imply that outdoor noise levels of up to around 68dB $L_{Aeq,16hour}$ could be accommodated without exceeding BS 8233: 2014 indoor ambient noise design guidance.

7.5 This suggests that the use of double glazed windows for the proposed dwellings should provide an adequate protection against transport related noise sources.

Alternative Means of Ventilation

7.6 Approved Document F (ADF) of the Building Regulations 2010 requires that all habitable rooms in dwellings have background ventilation. As noted earlier, a partially open window will typically reduce traffic noise by up to around 15dB(A) and it will not therefore be

appropriate to rely on conventional openable windows to provide background ventilation. As such, alternative means of ventilation will need to be provided to deliver the statutory requirements of ADF.

7.7 It is understood that the units are to be provided with a "System 1" ventilation scheme, as defined in approved document F of the Building Regulations, i.e. background ventilation provided by means of passive trickle vents and intermittent extract ventilation Purge ventilation would be provided by giving occupants the opportunity to open windows.

7.8 The use of such a system is also consistent with the guidance given in section 6.4.5.4 of BS 8233: 2014 which states:

> *"The Building Regulations' supporting documents on ventilation recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice."*

Industrial Noise Sources

7.9 Whilst the use of a long term average noise levels is considered appropriate for transport noise sources that exhibit 'normal' diurnal fluctuations, such a long term average is not considered to provide a robust indicator for industrial type activities. First, traffic flows to/from industrial areas may not exhibit the normal diurnal fluctuations, whilst process related activity can have distinct characteristics which may provoke a more significant adverse reaction than determined from a consideration of the overall A-weighted sound pressure level.

7.10 As highlighted in Section 4 above, detailed assessment methodologies for determining the potential impact of industrial noise sources on residential properties are set out in BS4142: 2014. Whilst the standard is normally applied to an assessment made at the façade of a building, it is considered reasonable for the rating methodology of this standard to be applied to the guidance of BS8233: 2014 indoor noise level guidance, to ensure that any noise with "characteristics" likely to attract attention, are controlled more stringently than anonymous transport sources.

7.11 In principle, therefore, it is suggested that when dealing with industrial noise sources, an assessment should be made based on a "short term" time period (e.g. 1 hour during the day and 15 minutes during the night, aligned with the approach of BS 4142: 2014); and

an appropriate rating correction should be applied to the noise source, prior to assessing its "acceptability" against BS 8233: 2014 indoor guidance values.

7.12 In addition to the above, it is also recommended that account is taken of the "maximum" sound level ($L_{Amax,fast}$) of possible night-time noise events.

7.13 In light of the above, it is proposed that noise intrusion into the proposed flats overlooking the existing industrial and commercial units at Silverdale Industrial Estate to the east of the site, is controlled in line with the following design targets:

Room Type	Design Target
Living Room – Daytime (07.00 to 23.00)	Rating Level <= 35 dB $L_{Ar,1hour}$
Bedroom - (23.00 to 07.00)	Rating Level <= 30 dB $L_{Ar,15min}$
	Maximum Level <= 45 dB $L_{Amax,fast}$

Table 7.1: Internal Design Targets for Industrial Noise

Sound Insulation Guidance

7.14 The level of sound insulation required to deliver the above design targets for industrial noise sources and the general control of noise from transportation sources will be determined by:

- The noise levels incident on a particular area of façade.
- The sound insulation capabilities of the constituent building elements.
- The relative proportion of building elements. The sound insulation required will increase as the façade area to a room increases. The sound insulation required of weaker performing elements (e.g. windows) will also increase when the proportional area of these is increased.
- The acoustic conditions of the receiving room. Noise intrusion into acoustically hard (reverberant) rooms, will increase sound insulation requirements.
- The "shape" of the façade. Façade features such as balconies can assist in reducing incident noise. However, balconies have the potential to increase incident noise due to additional sound reflections from the underside of any 'overhanging' structure which is above a balcony on the floor below.

Incident Noise Levels

7.15 The following typical traffic noise levels noise are calculated to be incident on the Rockingham Road elevation of the building:

Noise Index	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
$L_{Aeq,16hour}$	71	65	62	62	63	60	53	47
$L_{Aeq,8hour}$	67	61	58	58	59	56	49	43
$L_{Amax,fast}$	78	72	73	71	70	66	61	51

Table 7.2: Typical Incident Traffic Noise Levels (Rockingham Road)

Noise Index	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
$L_{Aeq,16hour}$	65	56	53	51	50	47	41	41
$L_{Aeq,8hour}$	61	52	49	47	46	45	37	37
$L_{Amax,fast}$	70	61	56	56	61	60	54	45

Table 7.3: Typical Incident Traffic Noise Levels (Rear Elevation)

Noise Index	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
$L_{Aeq,1hour}$	53	47	46	47	47	50	49	50

Table 7.4: Typical Incident Industrial Noise (Rear Elevation)

7.16 Based on site observations, the industrial noise was considered to include characteristics likely to attract attention (intermittency and general characteristics which make the sound discernible from other environmental sound sources). As such, it is proposed that when implementing the above incident noise levels an acoustic character correction of +6dB is applied to give the equivalent “rating” level of the noise.

Architectural Design

7.17 All calculations are based on relevant drawings for each block of flats prepared by STA Associates, which accompany the planning application.

Room Acoustic Conditions

7.18 For the purpose of this assessment, a reverberation time of 0.5 seconds has been assumed for all rooms, in line with the standardised reverberation time implemented in Approved Document E of the Building Regulations 2010.

Walls and Roof

7.19 The existing external walls are understood to be a masonry construction comprising a cavity brick-block construction. It is assumed that this construction is compatible with maintaining the following apparent sound reduction indices:

Apparent Sound Reduction Index, dB					
125 Hz	**250 Hz**	**500 Hz**	**1kHz**	**2kHz**	**4kHz**
41	43	48	50	55	55

Table 7.5: Assumed Apparent SRI's for Solid External Walls Elements

7.20 It is understood that it is proposed to retain the existing roof structure and for this to thermally and acoustically enhanced through the incorporation of rigid PIR insulation, internally lined with 2 x 12.5mm layers of "Soundbloc" plasterboard. It is assumed that this construction is compatible with maintaining the following apparent sound reduction indices:

Apparent Sound Reduction Index, dB					
125 Hz	**250 Hz**	**500 Hz**	**1kHz**	**2kHz**	**4kHz**
36	43	47	52	49	52

Table 7.6: Assumed Apparent SRI's for Solid External Walls Elements

Mitigation

7.21 Calculations have been undertaken in accordance with the methodology of BS EN ISO 12354-3: 2000: *"Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound"* to determine typical sound reduction performance requirements for windows and ventilators.

7.22 As noted earlier, it is proposed that the flats are ventilated in accordance with Approved Document F of the Building Regulations 2010. It is assumed that the living room/dining room and each bedroom will have a passive ventilator (e.g. trickle vent) offering a minimum equivalent area of 5000mm^2.

7.23 In order to control traffic noise intrusion to flats overlooking Rockingham Road, it is recommended that:

- Windows are selected to maintain a minimum weighted sound reduction index of R_w 38dB[4].
- Ventilators are selected to maintain a minimum element normalised weighted sound level level difference of D_{new} 42dB[4].

7.24 The sound reduction indices presented relate to the composite sound reduction of the window systems, including the glass, framing, mullions, transoms, seals, etc.

7.25 It should be noted that the values specified are based on an assumption that a single ventilator is required providing an equivalent area of 5000mm^2. If a greater equivalent area is required (i.e. more than one ventilator needs to be used), the acoustic performance value for **each** ventilator will need to be increased in line with the corrections set out in the following table:

No of Ventilators	Correction to be Applied to Specified D_{ne} Performance Value
1	0
2	+3
3	+5

Table 7.7: Corrections for Multiple Ventilators

Guidance Constructions

7.26 The sound insulation offered by a window system is not solely dependent upon the thickness of glass and separating airspace. The framing details, sealing arrangements etc. will all affect how the system will perform in practice. In view of this, it is not normally appropriate to recommend specific glazing configurations to meet the specified

[4] As determined in accordance with BS EN ISO 10140-2:2010: *"Acoustics. Laboratory Measurement of Sound Insulation of Building Elements. Measurement of Airborne Sound Insulation.'* and BS EN ISO 10140-4:2010: *'Acoustics. Laboratory measurement of sound insulation of building elements. Measurement procedures and requirements"*.

performance requirements and compliance should be verified by reference to acoustic data from proposed manufacturer's/suppliers. Notwithstanding the above, the specified acoustic performance values may typically be achievable with the following constructions:

- **Glazing** – Subject to any limitation resulting from adopted framing arrangements, etc., the recommended acoustic performance should be typically achievable with double glazed units comprising 6mm glass/16mm airspace/6.8mm laminated glass[5] (or similar system offering a minimum weighted sound reduction index of around R_w 38dB).
- **Ventilators** - An "acoustic" trickle vent offering a minimum performance of D_{neW} 42dB (e.g. Greenwood 5000EAW.AC2 trickle vent)..

7.27 Whilst traffic noise levels incident on the rear elevation of the building are lower than those incident on the front elevation, the rear elevation is also subject to industrial/commercial noise associated with the neighbouring units in Rockingham Wharf. It is therefore recommended that the same specification of glazing/ventilators outlined above are also used on the rear elevation, to provide mitigation against the operational noise associated with these premises. Calculations indicates that this glazing would enable the rating level of industrial noise within the apartments to comfortably comply with BS 8233 design recommendations, and build in some additional contingency for any change in the existing operational characteristics of these units.

Conclusions

7.28 It is concluded that the control of noise intrusion into the new residential units can be adequately controlled to avoid significant advice noise impacts and reduce other adverse impacts to a minimum through the appropriate specification of revised external building elements and alternative means of ventilations. The additional residential units and proposed changes to the external fabric of the building are therefore considered to comply fully with noise related national, regional and local planning policy.

[5] Based on published data by for Pilkington "Optiphon" double glazed units.

8 External Amenity Areas

Design Considerations

8.1 Guidance in the World Health Organisation's "Guidelines for Community Noise" recommends that noise levels in external amenity areas should not exceed 55dB $L_{Aeq,16hour}$.

8.2 Section 7.7.3.2 of BS 8233: 2014 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 guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noisy areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

8.3 Given that the site is within an urban environment (immediately adjacent to roads), it is unlikely to be feasible to comply fully with the aspirational amenity noise levels upper limit indicated in BS 8233. Notwithstanding this, it is feasible to reduce noise levels on balconies to the lowest practicable levels through the implementation of appropriate design provisions.

8.4 It is therefore recommended that balustrades to balconies are a "solid" construction to help provide acoustic screening and the underside of balconies are acoustically treated to minimise noise reflections.

8.5 These provisions should ensure that noise levels on balconies are controlled to the lowest practicable levels.

8.6 In addition to the above, it is considered to be equally relevant to note that the site is located within close proximity of the Rockingham Recreation Ground (a linear distance of approximately 170m to the south west of the site). The proximity of this park is considered to provide a potential off-set to the noise levels experienced in future

resident's private amenity space, as set out in the balancing test advocated in paragraph 009 of National Planning Practice Guidance.

Conclusion

8.7 In light of the above, it is concluded that whilst noise levels experienced on balconies overlooking Rockingham Road may not be deliverable in line with the aspirational design guidance of BS 8233: 2014, values will be reduced to the lowest practicable level and all flats will have access to suitable alternative amenity space, in line with NPPG off-set guidance.

9 Conclusions

Existing Noise Environment

9.1 Detailed noise monitoring has been undertaken to determine the existing environmental noise climate at the site. The front (Rockingham Road) elevation of the building is dominated by local traffic movements on Rockingham Road.

9.2 Traffic noise levels at the rear of the site are lower (due to the inherent screening effects of the building). However, rear windows are also influenced by some degree of operational noise from existing commercial/industrial units occupying Rockingham Wharf.

Planning Policy Context and Design Guidance

9.3 The requirements of national and local planning policy relevant to the proposed scheme are discussed. Reference has also been made to industry standard design guidance.

Site Suitability

9.4 The suitability of the site for residential development has been reviewed in the context of national and local planning policy and industry standard design guidance. This concludes that the site is suitable for residential development, subject to the implementation of appropriate mitigation.

Noise Intrusion

9.5 Preliminary calculations confirm that noise intrusion can be adequately controlled using appropriately specified external façade constructions, e.g. windows with acoustic double glazed units and alternative means of ventilation.

External Amenity Areas

9.6 Noise levels in private amenity spaces have been reduced to the lowest practicable levels through the use of solid balustrades and use of acoustically absorptive soffits where balconies project above others. Residents will also have reasonable access to alternative amenity spaces (e.g. Rockingham Recreation Ground).

Conclusion

9.7 In light of the above, it is concluded that the proposed development should not have any significant adverse impact on the health and/or quality of life for existing residential and

commercial neighbours of the site arising from noise and that the use of an appropriate sound insulation scheme will mitigate and reduce other adverse impacts to a minimum.

9.8 It is therefore concluded that the proposed development complies fully with noise related national, regional and local planning policy.

APPENDIX A: Glossary of Acoustic Terminology

Glossary of Acoustic Terminology

The acoustic terms used in this report are explained below:

dB : Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.

dB(A) : The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.

L_{eq} : The concept of Leq (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

Leq is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 1 hour).

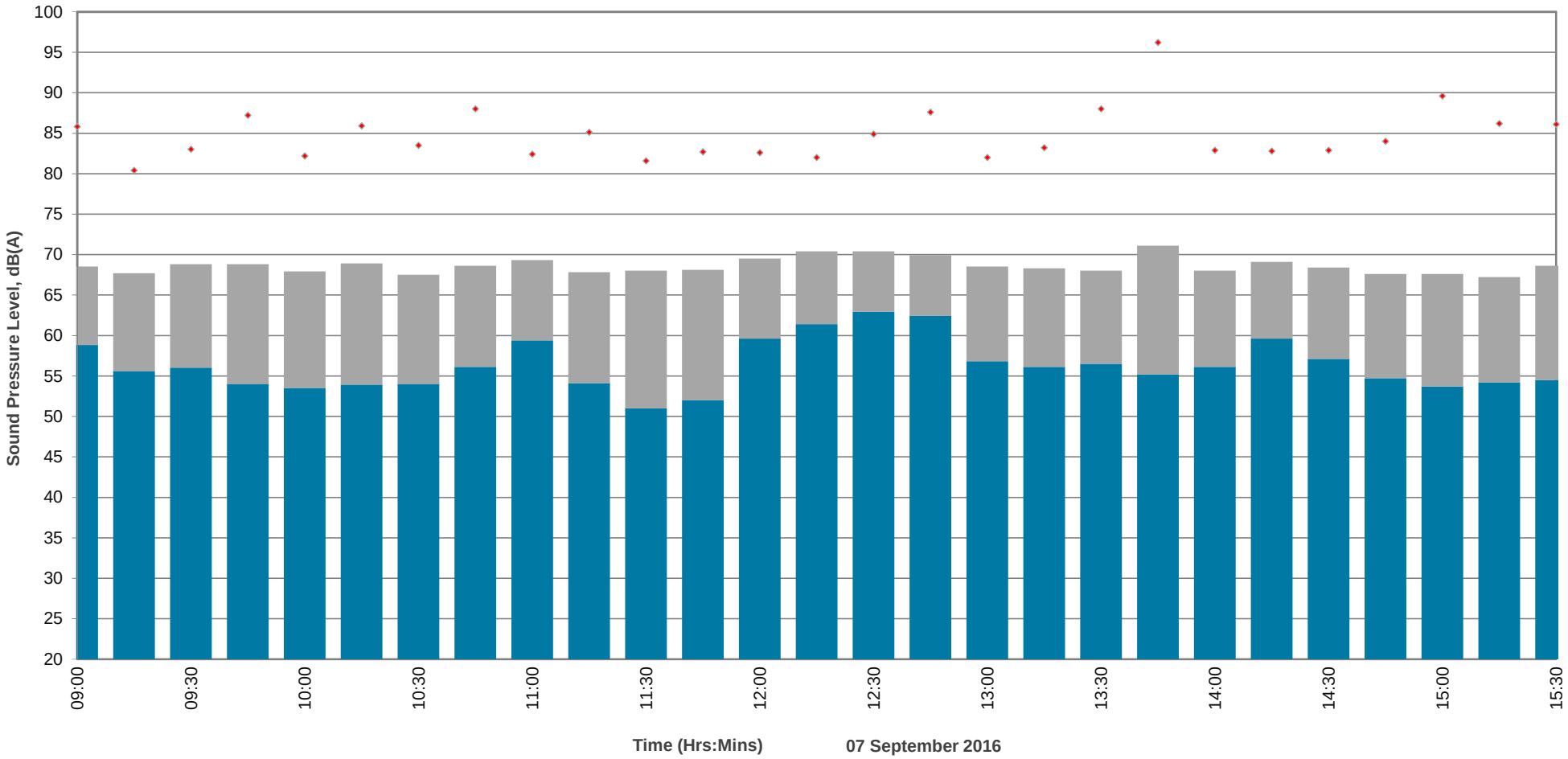
The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

L_{max} : L_{max} is the maximum sound pressure level recorded over the period stated. Lmax is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the Leq noise level.

APPENDIX B: Noise Monitoring Time History Plots

Time History Graph 1

Project:	Tavistock House, Uxbridge
Measurement Location:	Position 1 - Overlooking Rockingham Road
Survey Period:	07 September 2016

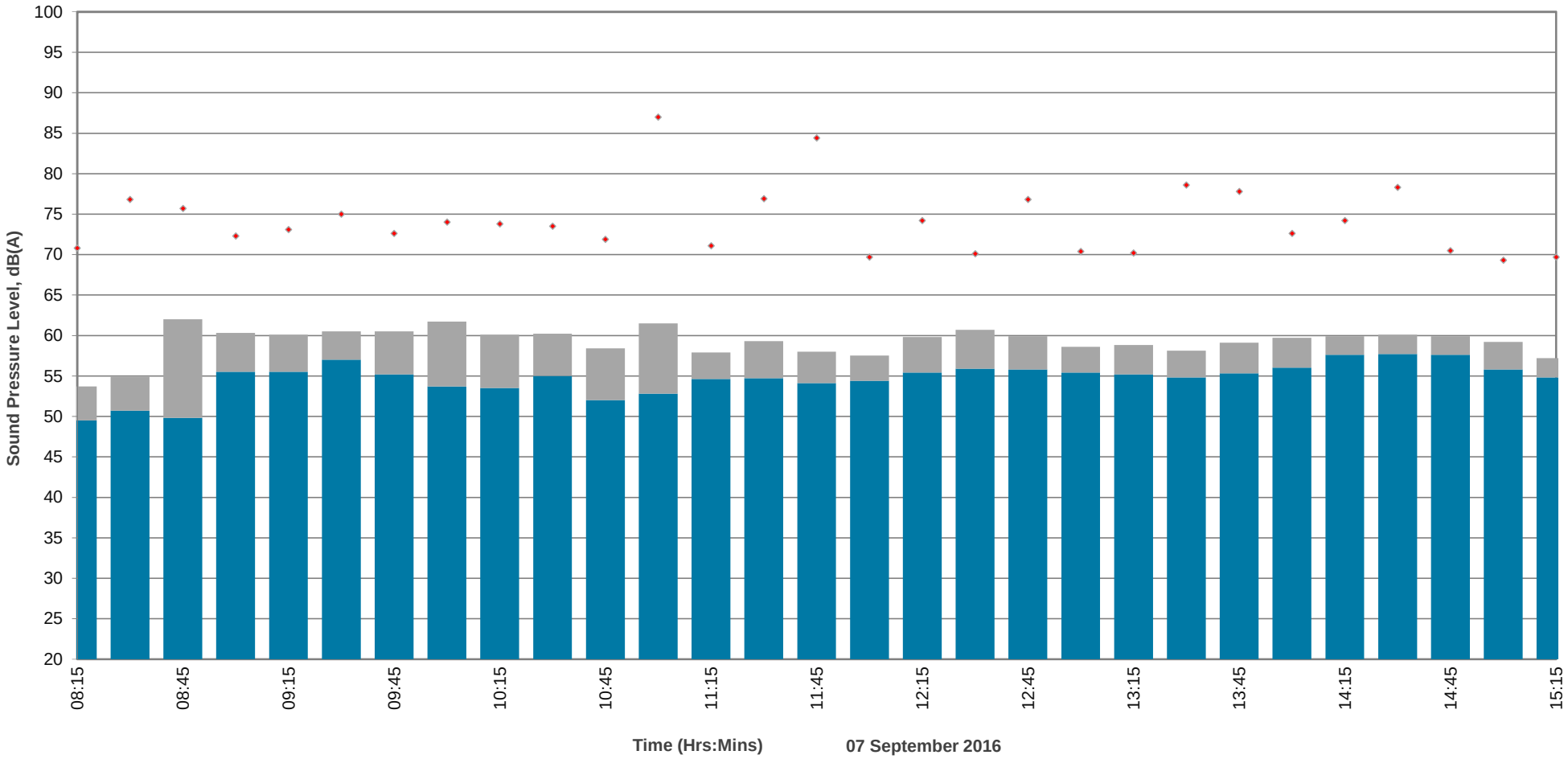


KEY: $L_{A90,15mins}$ $L_{Aeq,15mins}$ $L_{Amax,fast}$

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Time History Graph 2

Project:	Tavistock House, Rockingham Road, Uxbridge
Measurement Location:	Position 2 - Overlooking Rockingham Wharf
Survey Period:	07 September 2016



KEY: $L_{A90,15mins}$ $L_{Aeq,15mins}$ $L_{Amax,fast}$

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