



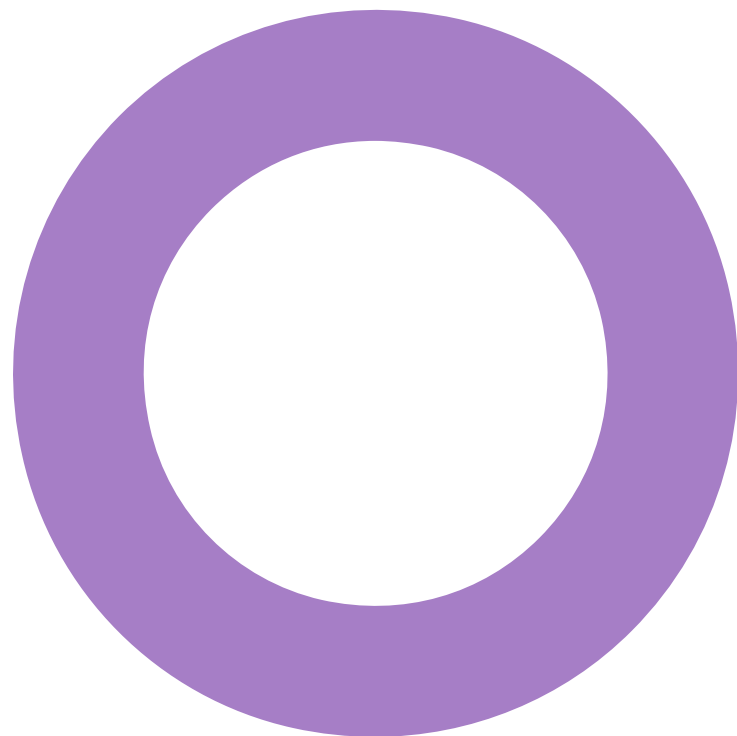
Manor Road / Richmond

Noise & Vibration Impact Assessment

**Manor Road.
Richmond.**
Avanton Richmond Developments Ltd.

ACOUSTICS
NOISE & VIBRATION IMPACT ASSESSMENT

REVISION 02 - 06 FEBRUARY 2019



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
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Contents.

Audit sheet.	2
Executive summary.	4
1. Introduction.	5
2. Site description.	5
2.1 Existing site	5
2.2 Proposed development	5
3. Basis of assessment.	6
3.1 Internal sound levels	6
3.2 External amenity spaces	6
3.3 Plant noise emissions	6
3.4 Vibration levels	6
4. Environmental sound survey.	7
4.1 Methodology	7
4.2 Results	7
5. Implications of environmental sound.	8
5.1 Specialist acoustic modelling	8
5.2 Design of façade	9
5.3 External Transportation Noise Risk Assessment	9
5.4 External amenity areas	9
5.5 Noise impact on residential properties to the south of the site.	10
6. Noise emissions of fixed plant.	11
7. Ground-borne vibration survey.	11
7.1 Methodology	11
7.2 Results	12
7.3 Vibration impact assessment	12
8. Summary and conclusion.	12
Appendix A – Acoustic terminology.	13
Appendix B – London Borough of Richmond upon Thames planning policy.	15
Appendix C – Environmental sound survey.	16
Appendix D – Predicted façade levels.	20

Appendix E – Environmental vibration survey.	24
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Executive summary.

There are plans to redevelop the Homebase site located at Manor Road, North Sheen within the London Borough of Richmond upon Thames. The proposals are to demolish the existing Homebase retail unit to provide a new mixed-use development consisting of residential and commercial units across four new blocks.

Environmental sound and vibration surveys have been undertaken to establish the existing conditions. The results have been used to assess the impact of sound and vibration on the proposed development. An assessment against local authority policy has been undertaken to identify any limits or specialist measures that may be required.

The environmental sound survey indicates that the site is exposed to relatively high levels of environmental sound, primarily governed by road and railway traffic activity in the local area. The results indicate that the background sound levels do not vary significantly between day to night periods.

The results of the environmental sound survey were used to validate a specialist acoustic model of the existing site. This modelling has been used to predict the sound levels incident on the proposed buildings and across the proposed site.

The modelling has also been used to assess the impact of the proposed buildings on the neighbouring properties; particularly the residential properties to the south of the site on Manor Park. The modelling indicates that with the proposed buildings the noise levels incident on the properties on Manor Park will remain the same as existing for the majority of the properties, even slightly decreasing for some properties.

An assessment has been undertaken to understand the implications of the existing sound environment on the design of the facade and ventilation design. This has been summarised as follows:

- The sound reduction performance of the external façade will be controlled by the performance of the glazing. Preliminary calculations have been undertaken and these indicate that, facades overlooking the road and railway lines, will require high-performance double-glazed systems.
- Mechanical ventilation is likely to be required for the majority of the development, with openable windows for purge ventilation.

Exact selections for the building services plant equipment are not available at this early stage. Guideline plant emission limits have been derived in line with local authority requirements. The plant emission limits proposed are not considered onerous and should be readily achieved with appropriate mitigation measures. It is reasonable to expect that these limiting levels can be enforced by condition.

Vibration measurements have been undertaken at several ground floor locations, in-line with the proposed facades of buildings across the development. The results indicate that the levels of vibration measured on site from railway sources were below the threshold required by the Local Authority and the British Standard threshold of *low probability of adverse comment*. As such, re-radiated sound from ground-borne vibration is not expected to require mitigation.

It is considered that any potentially significant environmental effects associated with the proposed development can be adequately controlled during the design stages, such that no significant effects would be likely.

1. Introduction.

There are plans to redevelop the Homebase site located at Manor Road, North Sheen within the London Borough of Richmond upon Thames. The proposals are to demolish the existing Homebase retail unit and provide a new mixed-use development consisting of residential and commercial units across four new blocks.

Environmental sound and vibration surveys have been undertaken to establish the existing conditions. The results have been used to assess the impact of sound and vibration on the proposed development. Comparisons have also been made with local authority policy to identify any limits or specialist measures that may be required.

The surveys and assessments have been undertaken in accordance with relevant British Standards, and this report has been prepared to support the planning application for the proposed development.

A glossary of the acoustic terms used in the report is provided in Appendix A.

2. Site description.

2.1 Existing site

The existing site is located on Manor Road, in North Sheen, London. The site is currently occupied by a Homebase retail unit, with supplementary surface level parking, and a bus terminal to the north east of the site.

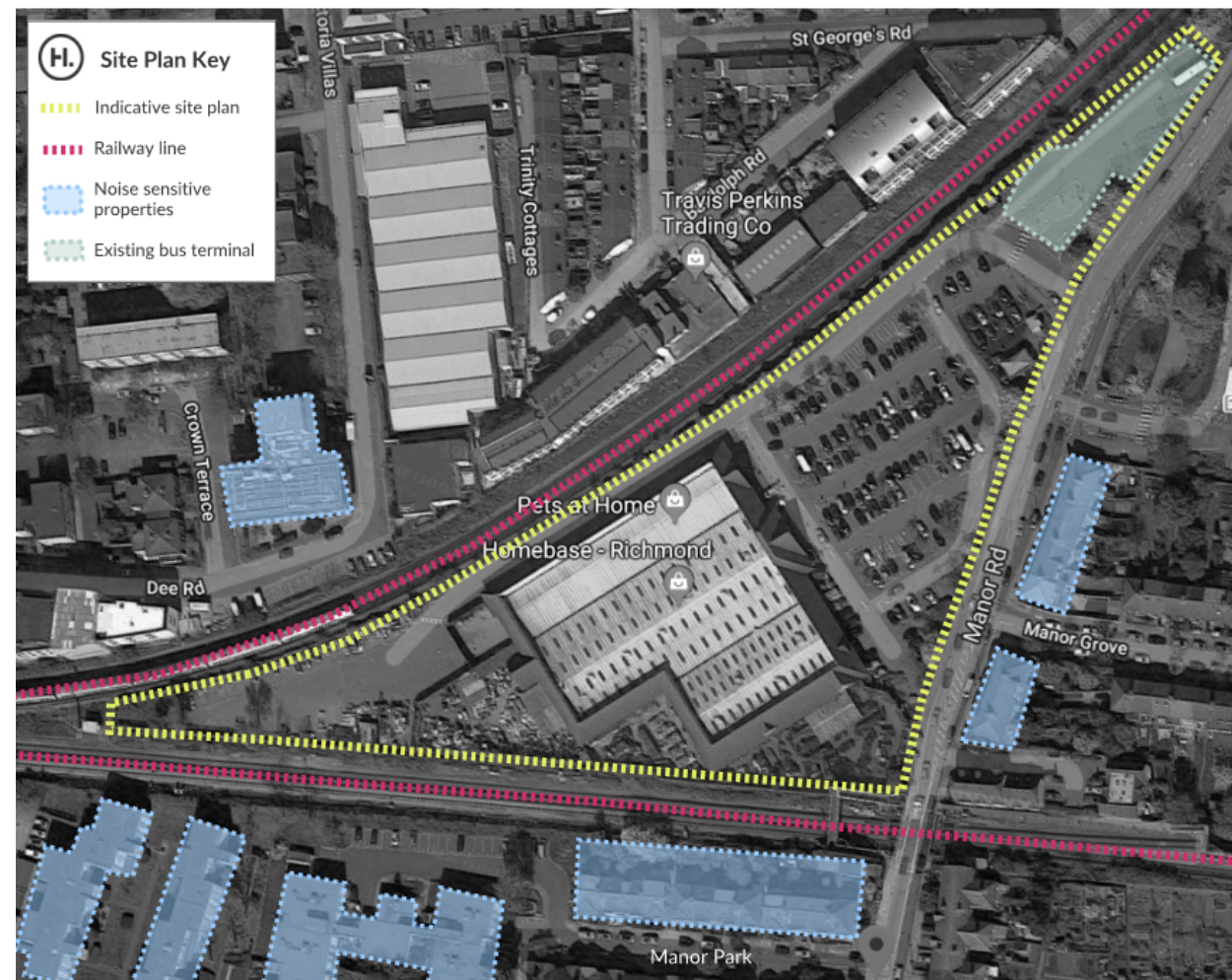


Figure 1 Indicative site plan

The site is bounded by railways to both the North and South. The east of the site is bounded by Manor Road.

The nearest noise sensitive properties to the site are the residential houses on Manor Park, directly to the south of the site. The site location, surrounding properties and the nearest noise sensitive receivers are illustrated in Figure 1.

2.2 Proposed development

The proposals are to redevelop the existing Homebase retail unit to provide a new mixed-use development across four new blocks, ranging between 4 and 9 stories high.

The new development is proposed to include a mix of private and affordable 1, 2 & 3 bed residential units, amenity areas, and 480 sqm of commercial space. The scheme is a car-free development with 12 disabled bays proposed on site.

The proposed ground floor level of the development is shown in Figure 2 below.



Figure 2 Proposed ground floor of the new development

3. Basis of assessment.

The following policy and guidance have been used for the acoustic survey and assessment:

- London Boroughs of Hillingdon, Hounslow & Richmond Upon Thames, Draft Supplementary Planning Document (SPD) 'Development Control for Noise Generating & Noise Sensitive Development', 2016.
- Mayor of London, Supplementary Planning Guidance (SPG) 'Sustainable Design and Construction', 2014.
- British Standard 8233, 'Guidance on sound insulation and noise reduction for buildings', 2014.
- British Standard 4142, 'Methods for rating and assessing industrial and commercial sound', 2014.
- National Planning Policy Framework (NPPF).
- World Health Organisation, 'Guidelines for Community Noise', 2012.
- British Standard 7445, 'Description and measurement of environmental noise', 2003.
- British Standard 6472, 'Guide to evaluation of human exposure to vibration in buildings', 2008.
- ANC Guidelines, Measurement & Assessment of Ground borne Noise & Vibration, 2nd edition, 2012.
- ISO/TS 14837-31, 'Mechanical vibration - Ground-borne noise and vibration arising from rail systems', 2017.
- Calculation of Railway Noise (CRN), 1995.
- Calculation of Road Traffic Noise (CRTN), 1988.

3.1 Internal sound levels

3.1.1 Residential areas

The London Boroughs of Hillingdon, Hounslow & Richmond Upon Thames Draft Supplementary Planning Document (SPD) 'Noise Sensitive & Noise Generating Development' sets out the following guidance for internal noise levels in line with British Standard BS8233.

Table 1 Local Authority guidance on internal sound levels

Situation	Location	Daytime 07:00 - 23:00 hrs	Night-time 23:00 - 07:00 hrs
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 $L_{Aeq,8hr}$
Sleeping	Bedroom	-	45 dB L_{AFmax} (several times in any one hour*)

*The SPD states that noise from individual events should not normally exceed 45 dB L_{AFmax} more than 10 times a night in sensitive rooms.

For reference, the guidance given in the SPD on internal sound levels is reproduced in full in Appendix B.

3.1.2 Commercial areas

For retail spaces, it is advised that internal ambient sound criteria are set in accordance with BS 8233. This varies depending on use, therefore, in order to maintain maximum flexibility for the future, at criteria of 40-45 dB $L_{Aeq,T}$ is proposed.

3.2 External amenity spaces

The Draft Supplementary Planning Document indicates the following guidance for sound in external amenity spaces:

"The acoustic environment of external amenity areas shall always be assessed and noise levels should ideally not be above the range 50 to 55dB $L_{Aeq,16hr}$. It may be necessary to carefully locate and design amenity areas and/or to provide acoustic screening in order to meet this goal."

The SPD also notes that in some circumstances it may be appropriate to vary, or not to apply, these goals in order to meet wider planning objectives in line with guidance in British Standard BS 8233.

For reference, the guidance given in the SPD on sound levels in external amenity spaces is reproduced in full in Appendix B.

3.3 Plant noise emissions

The SPD sets out the following guidance for the control of building services noise for industrial and commercial developments in line with guidance in British Standard BS 4142.

Table 2 Local Authority guidance on plant noise emissions

Noise impact from relevant proposed industrial or commercial premises or plant	Development outcome
Rating level ($L_{Ar,Tr}$) is at least 5 dB below the background level L_{A90}	Normally acceptable
Rating level ($L_{Ar,Tr}$) is no more than 5 dB above the background level L_{A90}	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating level ($L_{Ar,Tr}$) is more than 5 dB above the background level L_{A90}	Normally unacceptable

As such, for this development, the maximum emission level (dB $L_{Aeq,15min}$) should not exceed 5 dB below the minimum external background noise at the nearest noise sensitive premises.

3.4 Vibration levels

The Local Authority will normally require a vibration assessment where railways, either surface or underground, are within 30 m of a proposed development.

The SPD sets out guidance on acceptable levels of vibration within residential developments, in line with British Standard BS 6472-1, expressed in terms of vibration dose values (VDVs) and presented in Table 3.

Table 3 Local Authority guidance on vibration in residential areas

Location	Day-time 07:00 - 23:00 hrs	Night-time 23:00 - 07:00 hrs
Residential	< 0.2 $ms^{-1.75}$	< 0.1 $ms^{-1.75}$

These values are in line with the BS 6472-1 threshold of 'low probability of adverse comment'.

The SPD also states that re-radiated noise, as a result of vibration from adjacent railways and other sources, shall not exceed 35 dB L_{ASmax} within habitable residential rooms.

4. Environmental sound survey.

An acoustic survey has been carried out at the proposed site to establish the prevailing local environmental sound conditions.

4.1 Methodology

The survey was undertaken between the 20th July and 25th July 2018 and comprised six days of unattended sound measurements by a single sound level meter with additional attended short-term sound measurements taken at various locations across the site. The measurement positions are illustrated in Figure 3.

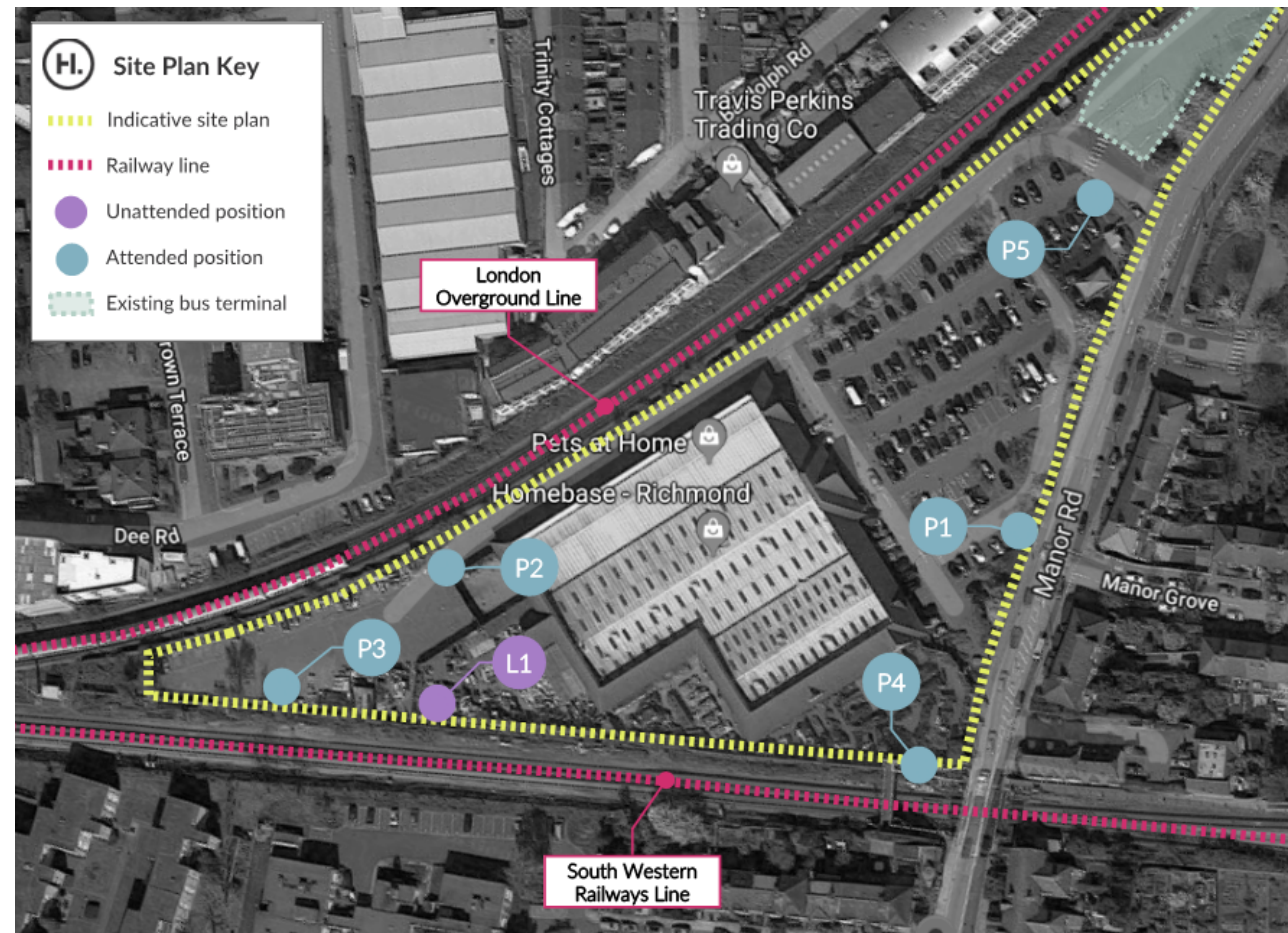


Figure 3 Measurement positions

A summary of the survey details and results are set out in the Sections below. Full details of the survey, measurement conditions and equipment details are provided in Appendix C.

4.1.1 Unattended measurements

The unattended measurement position L1 was located within the rear service yard of the Homebase on the existing site. The measurement location was deemed representative of the nearest residential receivers, the rear of the properties to the south of the site on Manor Park.

There are few train passes during night-time period. It is expected that background noise levels measured at position L1 during the night-time periods are representative of the nearby residential properties both to the north and the south of the site.

Measurements recorded consisted of contiguous fifteen-minute samples of ambient noise levels ($L_{Aeq,15min}$ in dB), maximum noise levels ($L_{Amax,15min}$ in dB) and background noise levels ($L_{A90,15min}$ in dB) between Friday 20th July 2018 and Wednesday 25th July 2018.

The measurement position was at a height of approximately 1.2 metres above ground level and considered free-field.

4.1.2 Attended measurements

Short-term attended measurements were taken on Friday 20th July and Wednesday 25th July 2018 to acquire representative sound data from nearby transportation sources.

The measurement positions, as presented in Figure 3, were selected to capture the following sources:

- P1 - Continuous measurements of road traffic sound emissions over four hours.
- P2 - Measurements of sound from operational trains along the north boundary of the site, approximately 1.5 m above ground floor level.
- P3 - Measurements of sound from operational trains along the south boundary of the site, approximately 1.5 m above ground floor level.
- P4 - Measurements of sound from operational trains along the south boundary of the site, on the pedestrian bridge over the train line approximately 4 m above ground level.
- P5 - Measurements of sound from bus movements from the bus terminal towards the northeast corner of the site, approximately 1.5 m above ground floor level.

All attended measurement positions were considered free-field.

4.2 Results

4.2.1 Unattended measurements

A summary of the unattended measurements recorded at position L1 is provided in Table 4. Full detailed results and a time history are shown in Appendix C.

Table 4: Summary of long-term noise monitoring at position L1

Period, T	Typical average ambient sound level, dB $L_{Aeq,T}$	Typical maximum event level*, dB $L_{Amax,15min}$	Typical minimum background noise level, dB $L_{A90,T}$
Day (07:00-23:00)	62	87	41
Night (23:00-07:00)	59	83	39

* Typical maximum is based on the highest 90th percentile of the measured data

4.2.2 Attended measurements

The results of the short-term measurements are summarised in Figure 4.

The sound levels presented for the railway sources were undertaken for the duration of a train pass-by. Each event varied in duration from approximately 10 – 30 seconds. A sample of at least ten events were measured at each location.

The different types of trains measured at the various measurement locations were as follows:

- P2 (along the north boundary of the site) - London Overground and London Underground District Line trains
- P3 (along the south boundary of the site) – South Western Railways and Freight trains
- P4 (on the pedestrian bridge over the southern train line) – South Western Railways

The average sound pressure levels presented for the road traffic sources at position P1 are based on measurements taken over a three-hour period, in line with the guidance provided in the *Calculation of Road Traffic Noise* document dated 1988 (CRTN).

The sound levels presented for bus sources at position P5 were undertaken for the duration of a bus pass-by. Each event varied in duration from approximately 6 – 13 seconds.

For each measurement position both average levels in terms of $L_{Aeq,T}$, and maximum levels in terms of L_{AFmax} , are given.

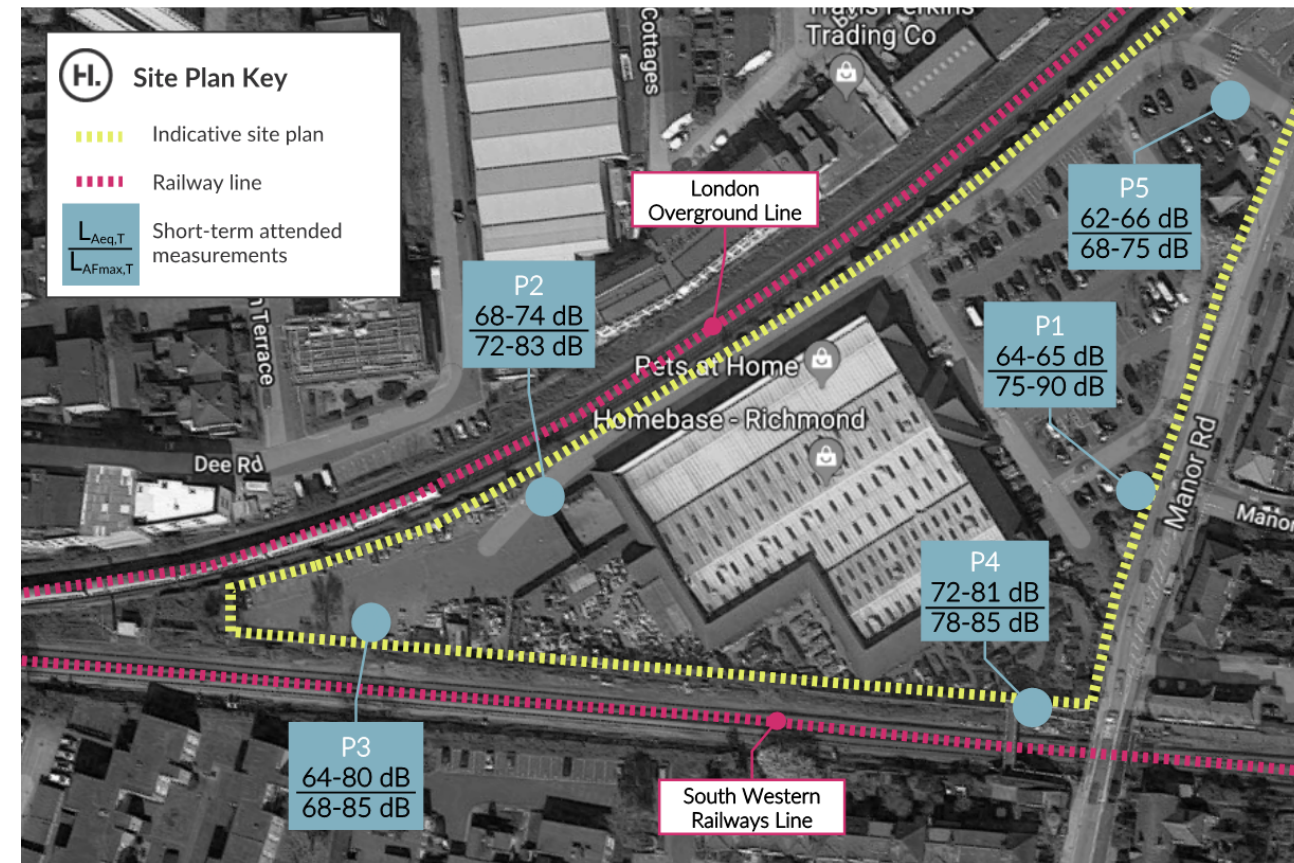


Figure 4 Summary of short-term attended measurement results

The dominant sources of sound local to the site are from road traffic on Manor Road and railway traffic on the London Overground and South Western Rail lines. Some aircraft activity was noted while on site, however the associated sound levels did not impact noticeably on the measured levels, when compared to the road and railway traffic sources.

The results of the above measurements were used to calculate the average sound levels over a full day (07:00 – 23:00) and night (23:00 – 07:00) at the site from both railway lines and road traffic.

The average sound levels from trains and rail traffic were calculated using the methodology set out in the *Calculation of Railway Noise* document dated 1995 (CRN), while the road traffic sound levels were predicted following the methodology set out in the *Calculation of Road Traffic Noise* document dated 1988 (CRTN).

The predicted average daytime and night time sound levels from railway and road traffic sources at the various measurement positions are presented in Table 5.

A correction factor, accounting for differences in height and relative distance from the railway line has been applied to all measurements at 1.5 m above ground level, in accordance with CRTN methodology. This is equivalent to an increase of 3.5 dB to all results at positions P2 and P3.

Table 5 Predicted average daytime and night time sound levels from railway and road traffic sources

Measurement location	Sound source	Calculated average sound levels from road traffic and railway sources (dB)	
		Daytime (07:00 – 23:00), $L_{Aeq,16hr}$	Night time (23:00 – 07:00), $L_{Aeq,8hr}$
P1	Road	67	57
P2	Railway	65	60
P3		62	56
P4		66	61

5. Implications of environmental sound.

The existing sound levels in the vicinity of the site have implications on the design of the façades and the ventilation strategy of the proposed development. These are discussed in the following sections.

5.1 Specialist acoustic modelling

The results of the environmental sound survey were used to validate a specialist acoustic computer model of the existing site developed using Cadna-A software. The model methodology is in accordance with CRN and CRTN. The model was then used to predict the variation in sound levels that would affect different parts of the proposed scheme. Images of the model results for the average daytime $L_{Aeq,T}$ are shown in Figure 5 below.

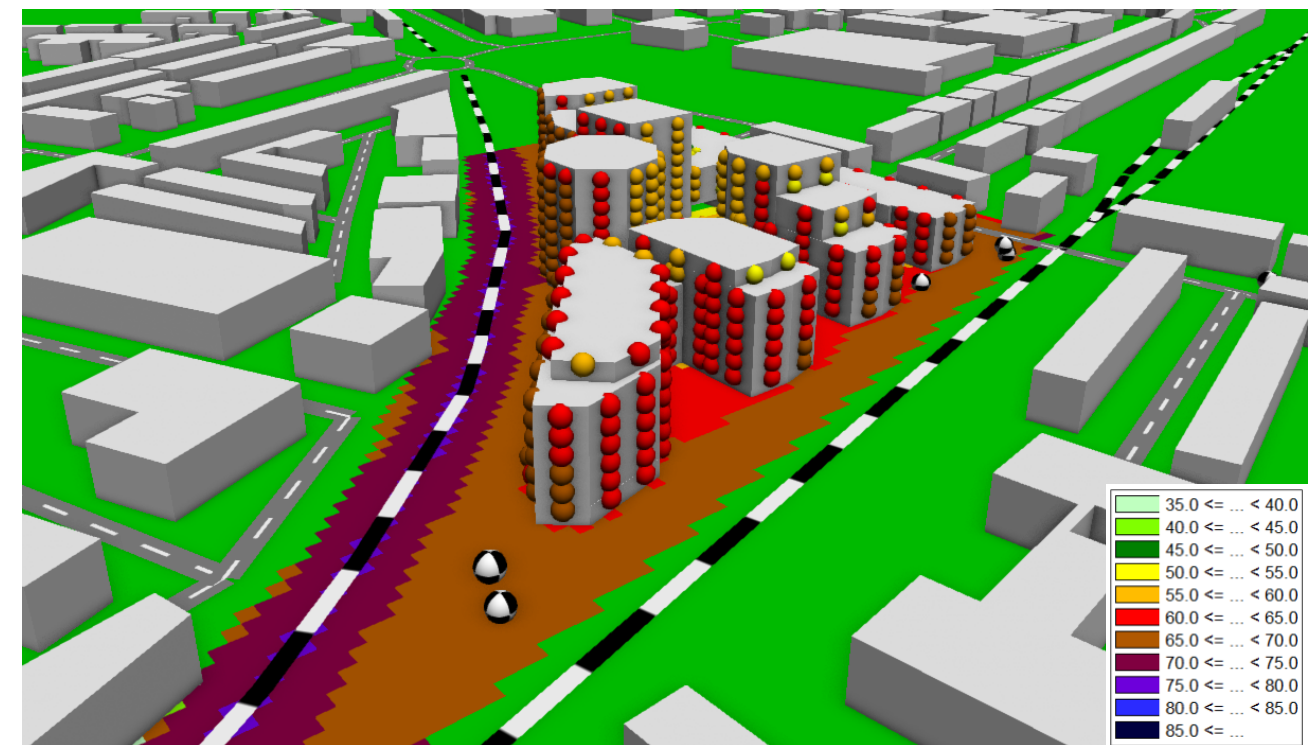


Figure 5 Image from specialist acoustic model, looking northwest - Predicted daytime levels L_{Aeq} .

By defining the sound level at the façades of the new buildings, the sound insulation requirements of the façades and the ventilation strategy can be established. These are discussed in the sections below.

Results of the predicted façade levels across the development are presented in more depth in Appendix D.

5.2 Design of façade

At the planning application stage, allowance should be made for high performance double glazing of circa **45 dB R_w** on those elevations most exposed to rail and road traffic noise.

It is expected that glazing on other façades, more screened from the rail and road noise, is likely to require a lower performance. The glazing specification will be refined as the design develops through the RIBA stages post planning.

Solid elements of the façade and the roofs should achieve a performance of at least **55 dB R_w**. This is achievable with both traditional and suitably build-up light-weight systems.

Mechanical ventilation is likely to be required for the majority of the development, with openable windows for purge ventilation.

It is considered that appropriate internal noise levels can be achieved with good acoustic design to the façade elements.

5.3 External Transportation Noise Risk Assessment

The Draft Supplementary Planning Document "Noise Sensitive & Noise Generating Development" drawn up by the three London Boroughs previously indicated, describes the initial site noise risk assessment procedure to be followed and the concept of Noise Risk Categories (NRC). The initial site noise risk assessment table from the draft SPD is reproduced below.

External Transportation Noise Risk Assessment (measured/predicted, empty site, pre-mitigation)

Noise Risk Category*	Potential Effect if <u>unmitigated</u>	<u>Pre-Planning Application Guidance</u>
0 – Negligible L _{Aeq,16hr} < 50dB L _{Aeq,8hr} < 40dB	No adverse effect on health and quality of life	Development proposal is likely to be acceptable from a noise perspective. Noise assessment /report required to demonstrate no adverse impacts Good acoustic design encouraged to improve existing environment
1 – Low L _{Aeq,16hr} 50-63dB L _{Aeq,8hr} 40-55dB	Adverse effect on health and quality of life	Noise environment likely to cause adverse impacts Noise assessment /report required to demonstrate how adverse impacts will be minimised and how good acoustic design will be implemented. Planning conditions and other measures to control noise are likely to be required.
2 – Medium L _{Aeq,16hr} 63-69dB L _{Aeq,8hr} 55-60dB L _{A,Smx} <82dB	Significant adverse effect on health and quality of life	Noise environment likely to cause significant adverse impacts and development may be refused unless Noise assessment /report required to demonstrate how significant adverse impacts will be avoided and other adverse impacts <u>minimised</u> and how good acoustic design will be implemented Planning conditions and other measures to minimise noise will be necessary.
3 – High L _{Aeq,16hr} > 69dB L _{Aeq,8hr} > 60dB L _{A,Smx} <82dB	Unacceptable adverse effect on health and quality of life	Noise environment likely to cause unacceptable adverse impacts and development likely to be refused even if a good acoustic design process is followed, unless there is an overriding case for development in the context of Government policy on sustainable development.

Figure 6 Reproduction of Initial Site Noise Risk Assessment table from SPD

The predicted daytime and night-time façade levels, as reported in Appendix D, are compared with the Noise Risk Categories in Table 6 and Table 7 below.

Table 6 Comparison of predicted daytime facade levels against Noise Risk Categories

Predicted external daytime noise level, dB(A)	Noise Risk Category (NRC)	Comments
65 – 68	2 - Medium	– This can be dealt with by appropriate façade and ventilation design, as set out in Section 5.2 above, and the setting of appropriate planning conditions.
60 – 64	1 - Low to 2 - Medium	
50 – 59	1 - Low	
< 50	0 – Negligible	– These areas are within the internal courtyard of the proposed buildings to the north of the site.

Table 7 Comparison of predicted night-time facade levels against Noise Risk Categories

Predicted external night-time noise level, dB(A)	Noise Risk Category (NRC)	Comments
60 – 63	2 - Medium to 3 - High	– There are limited areas, at low level, where predicted façade sound levels are 1-3 dB above the medium NRC. – A difference of this magnitude would not normally be a perceptible difference outside of laboratory conditions. – This can be dealt with by appropriate façade and ventilation design, as set out in Section 5.2 above, and the setting of appropriate planning conditions.
55 – 59	2 - Medium	– This can be dealt with by appropriate façade and ventilation design, as set out in Section 5.2 above, and the setting of appropriate planning conditions.
40 – 54	1 - Low	

5.4 External amenity areas

Both the National Planning Policy Framework and the Greater London Authority (under the London Plan) advise to identify and protect amenity areas from noise.

The World Health Organisation (WHO) provides guidance on noise levels for outdoor areas, advising that to avoid annoyance to most people a level of less than 55 dB and ideally less than 50 dB L_{Aeq} should be targeted.

An image from the model is presented in Figure 7 showing the predicted daytime L_{Aeq} sound levels across some of the proposed ground level external amenity areas. As it can be seen, sound levels within the majority of the main ground level landscaped areas are expected to exceed 55 dB, with the exception of the more screened internal courtyard of the buildings to the north of the site.

It is therefore recommended that screening to noise from the site boundary is incorporated into the landscaping design. Screening would be most effective along the boundaries of the two railway lines and along the boundary of Manor Road. In order to provide sufficient acoustic benefit, the screening along the boundaries should be solid (i.e. close border timber fencing) and be at a height of at least 2.5m.