Redington Gardens Ltd

24 Redington Gardens

Noise Assessment

Job No:	1012407
Doc Ref:	1012407-RPT-AS0001
Latest Revision:	-
Date:	11/11/2015

Project name	24 Redington Gardens	Job Number
Report Name	Noise Assessment	1012407

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision

Document Validation (latest issue)

Revision	Issue Date	Purpose of issue / description of revision / version			
----	11/11/2015	Noise Assessment			
			Prepared by	Checked by	Verified by
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Executive Summary

A noise survey and assessment has been undertaken for the proposed residential development at 24 Redington Gardens in West Hampstead, London. Existing noise levels at the site have been measured and compared to national and local noise policy in addition to relevant standards and guidance.

The assessment has indicated that the levels measured at the site are below those at which planning permission would be refused or attenuation measures required by Local Authority.

In addition, the assessment has also indicated that noise levels within the proposed development are likely to meet the guideline noise criteria contained in BS 8233: 2014 through the use of an appropriately specified glazing system. The following table summarises the identified glazing performance and a potentially suitable glazing configuration (see Section 5.2 for more information).

Façade	Glazing attenuation target, dB $R_w + C_{tr}$	Suggested Glazing Specification*
All	25	4 mm pane / 6-16 cavity / 4mm pane
* Glazing performance values assumed in this report are based on information provided by the Pilkington website (accessed 21/10/2015). These values are for glazing within a sealed unit only. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing. Alternative glazing products may be suitable but should provide equal or greater sound insulation performance.		

Table 1 – Glazing performance requirements

Limiting noise levels for externally mounted services plant have also been suggested, based on the Local Authority noise policy and British Standard guidelines.

The proposed building services plant noise limits at the façade of the nearest noise sensitive receptor are summarised in the table below (see Section 5.3 for more information):

Period	Typical $L_{A90,15min}$ dBA	Plant noise limit at façade of noise sensitive receptor L_{AeqT}	
		Not Tonal	Tonal/Impulsive
Day (07:00 - 23:00)	39	34	29*
Evening (19:00 – 23:00)	36	31	26*
Night (23:00 - 07:00)	31	26*	21*
* It should be noted that taking into account the guidance in BS 4142, in a city environment it is not usually considered necessary to control external noise from plant and equipment to below 30 dB as internal noise levels, even with windows open, will be approaching a level at which they are unlikely to be perceptible. Therefore, it may be that a lower cut off of 30 dB $L_{Aeq,T}$ is appropriate, however, this would need to be confirmed with the Local Authority.			

Table 2 – Limiting noise levels for services plant

Vibration and ground-borne noise has not been assessed as there were judged to be no vibration sources close enough to the site to result in adverse impacts at sensitive receptors.

Contents

1. Introduction

Cundall has been instructed by Redington Gardens Ltd to undertake a noise assessment for the proposed residential development at 24 Redington Gardens, London.

The current proposal comprises the replacement of the existing residential building at 24 Redington Gardens with a new built property in the same location.

The purpose of this report is as follows:

- to document existing ambient and background noise levels around the site;
- to assess the potential noise impact on the proposed development from the existing ambient noise sources;
- to suggest glazing and ventilation specifications for the purposes of mitigating the potential adverse noise impact caused by surrounding roads and other noise sources on the proposed development; and
- to suggest limiting noise levels for externally mounted services plant.

Appendix 1 presents the acoustic terms, definitions and symbols used in this report.

2. Site Description

The site is located in the Redington Frognal Conservation Area in the West Hampstead area of Camden, London.

The red outline in Figure 1 below provides an indication of the extent of the site.

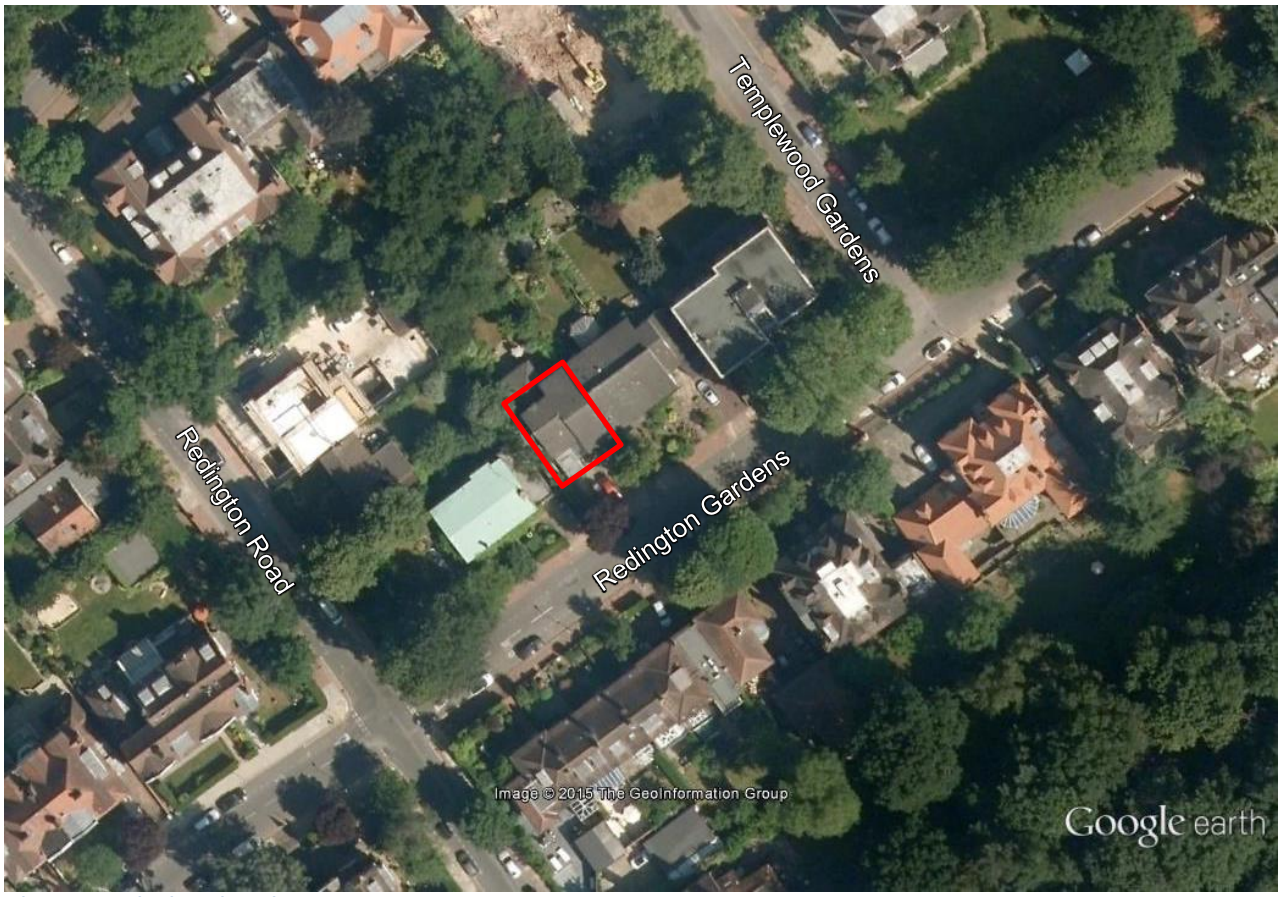

Figure 1 – Site location plan

The land use in the immediate surrounding area is residential. The main sources of noise affecting the site during the day were considered to be road traffic on surrounding streets and aircraft.

Several properties in the area were having refurbishment, maintenance or extension work carried out which was also a significant feature of the noise climate. However, for the purposes of establishing a background noise level, L_{A90} values are considered to be representative of the typical noise level in the area due to the intermittent nature of these noise sources.

3. Assessment Criteria

This section of the report outlines the key legislation and guidance relevant to the assessment of noise for a development of this type.

3.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published by Defra in March 2010. This NPSE sets out the long term vision of Government noise policy:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

The NPSE long term vision is supported by the following aims:

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

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life."

3.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012. The NPPF is part of government reform to make the planning system less complex and more accessible, and to promote sustainable growth. It replaces existing national planning policies such as Planning Policy Guidance PPG24: Planning and Noise.

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."

3.3 Planning Practice Guidance

In March 2014 Planning Practice Guidance for noise was published. This online document advises on how planning can manage potential noise impacts in new development.

3.4 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

British Standard 8233: 2014 provides guidance on internal ambient noise levels in residential and non-residential spaces. The following table summarises this guidance relevant to the proposed development:

Location	BS 8233: 2014	
	Daytime	Night-time
Living room	35 dB $L_{Aeq,16hour}$	-
Dining room/area	40 dB $L_{Aeq,16hour}$	-
Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 3 – Indoor ambient noise levels for domestic buildings

BS 8233: 2014 does not provide internal noise criteria for individual events in terms of $L_{AFmax,}$ however it does state:

"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."

The previous version of BS 8233 (published in 1999) states that:

"For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB L_{Amax}"

3.5 BS 4142:2014 'Method for rating and assessing industrial and commercial sound'

The BS 4142 method involves comparing the rating level (the 'specific' sound level plus a range of potential feature corrections) of the sound source to the measured background sound level in order to estimate its initial impact. BS 4142 states the following should be considered:

- "Typically, the greater this difference, the greater the magnitude of the impact.
- 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."

The new 2014 version of the standard suggests that the noise source of interest will have a 'low impact' when the 'rating level' of a noise source does not exceed the existing background noise. It is also important to note that the standard requires that any quantitative assessment results are assess in light of the context in which the sound occurs.

With regards to background noise levels, BS 4142: 2014 states:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

3.6 Local Policy

Within the Camden Development Policies 2010-2015 document, Camden London Borough Council have a specific Development Policy relating to noise called DP28 – Noise and Vibration. DP28 sets out the following noise limits which are relevant to this development:

3.6.1 Noise levels on residential sites adjoining railways and roads

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

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

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

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

3.6.2 Limiting noise levels for services plant

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$L_{Aeq'}$

3.7 Adopted Assessment Criteria

3.7.1 Noise level on residential sites adjoining railways and roads

Camden London Borough Council's Development Policy 28 sets out the noise conditions under which development may or may be not granted planning permission. The Table below presents these requirements.

Period	Planning Not Granted $L_{Aeq,T}$ in dB	Attenuation required $L_{Aeq,T}$ in dB
Day (07:00 - 19:00)	≥ 72	≥ 62
Evening (19:00 - 23:00)	≥ 72	≥ 57
Night (23:00 – 07:00)	≥ 66	≥ 52

Table 4 – Noise conditions under which development may or may be not granted planning permission.

3.7.2 Building Envelope Design

Based on the guidance in BS 8233, the following internal ambient noise level design criteria have been adopted (as shown in Table 5).

Location	BS 8233: 2014	
	Daytime	Night-time
Living room	35 dB $L_{Aeq,16hour}$	-
Dining room/area	40 dB $L_{Aeq,16hour}$	-
Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Afmax,inside}$[1]

Table 5 – Indoor ambient noise levels for domestic buildings

[1]Note: It is important to note that the L_{Afmax} criteria for night time within bedrooms identified in the table above is judged to represent best practice, however, it is not a planning requirement of Camden London Borough Council or a guideline of the new 8233:2014. Therefore, where complying with the L_{Afmax} criteria identified above has a significant impact upon the glazing or ventilation specification; it is recommended that this is examined in more detail at the detailed design stage. The benefits of meeting this standard should be compared against any drawbacks (e.g. requiring mechanical ventilation that may not be the most sustainable ventilation solution).

3.7.3 Plant Noise Limits

Camden London Borough Council's Development Policy 28 sets out the following plant noise limits:

- The noise emission from new items of fixed services plant to be designed not to exceed 5 dB (10 dB if tonal or impulsive) below the background noise level [$L_{A90,T}$] at 1 metre external to a sensitive façade.

4. Environmental Noise Survey

This section of the report describes the environmental noise survey undertaken.

4.1 Survey Methodology

In order to characterise the ambient noise climate of the site a noise survey has been undertaken consisting of attended and unattended noise measurements between the 8th and 12th May 2015.

Weather conditions for the duration of the surveys were dry and overcast with low wind speeds below recommended maximum limits in BS 7445-2[1]. It is therefore considered that the weather conditions during the noise survey would be unlikely to result in atypical background noise levels.

Measurements were made of various noise descriptors, but the key index used in this assessment are as follows:

- $L_{Aeq,T}$ – the equivalent continuous A-weighted sound pressure level over a given time period, *T*
- L_{Amax} – the maximum A-weighted noise level within a particular measurement period
- $L_{A90,T}$ – the A-weighted noise level exceeded for 90% of the measurement period, *T*, commonly accepted as being the 'background' noise level.

The time period, T, was set to 15 minutes and the profile function was set to 5 minutes for the duration of the surveys.

4.2 Measurement Locations

The unattended and attended monitoring was conducted in two locations considered representative of the local noise climate at the proposed site and nearest noise sensitive receptors, as indicated in Figure 2 below (location UP1 and AP1). The locations are described as follows:

Location UP1: Unattended noise monitoring at the garden of 26 Redington Gardens approximately 18m from the north west façade of the existing building.

Location AP1: Attended noise monitoring at the pavement at a distance of approximately 2.5m from Redington Gardens Street edge.

Figure 2 presents an indicative location of measurement positions.

[1] BS 7445-2: Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use

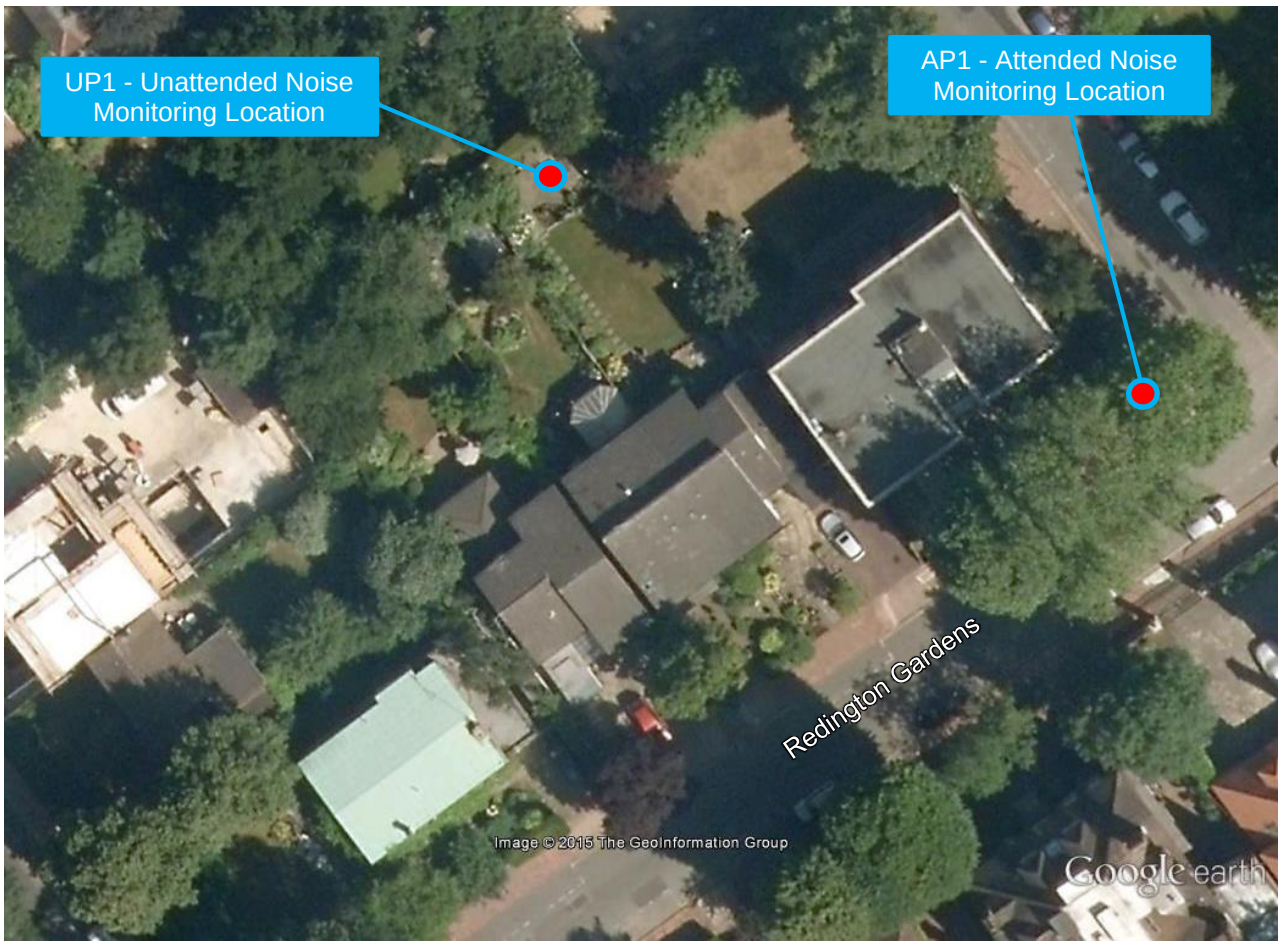

Figure 2 – Indicative measurement locations

4.3 Survey Equipment

Noise measurements were carried out with CEL 633 sound level meters. The instrumentation used conforms to BS EN 60651 Type 1 accuracy. The sound level meters were fitted with a windshield and the instrumentation was field calibrated before and after use in accordance with the manufacturer's instructions. No significant drift in calibration was witnessed.

4.4 Noise Survey Results

The results of the survey are shown in Table 6 below, all values are measured free-field levels in A-weighted decibels, more detailed results are available upon request.

Location	Period	Max. Ave. $L_{Aeq,T}$ * in dB	Typical $L_{A90,T}$ ** in dB	Typical L_{AFmax} *** in dB
UP1	Day (07:00 - 19:00)	57	39	77
	Evening (19:00 - 23:00)	45	36	64
	Night (23:00 – 07:00)	50	31	64
AP1	Day (07:00-19:00)	54	46	72

* $L_{Aeq,15min}$ values were log-averaged over each time period for each day and then the highest daily value reported. This is considered to represent a worst-case scenario when judging the potential suitability of the site for residential development.

** The mode of the $L_{A90,15min}$ values was calculated for each time period (day, evening, night) for each separate day. The lowest of these values has been reported. These values were then judged against a plot of all measured $L_{A90,15min}$ values and are considered to represent the typical background noise levels on the site (and at the surrounding receptors) on a quiet day. This value is therefore considered to be an appropriate value for use in setting plant noise limits at the facades of the nearest noise-sensitive receptors to the site.

*** Typical L_{AFmax} values were derived by analysing the measured 5 min values in each assessment period (day, evening and night). For each period the average value plus 1 and 2 standard deviations was calculated, in addition to the 90th percentile value was also calculated. The calculated values were then assessed against a graph of all measured $L_{AFmax,5min}$ data and a representative 'typical' value was identified; i.e. an L_{AFmax} value which is not regularly exceeded in a given time period. These values are reported.

Table 6 - Measurement results

It is important to note that the measured $L_{Aeq,T}$ noise levels at Locations UP1 and AP1 are very similar. This is due to there being very little traffic on Redington gardens and the dominant noise source being more distant road traffic and aircraft affecting the whole site. It is therefore judged that measurements at Location 2 are representative of noise levels incident upon all facades of the proposed dwellings.

5. Site Suitability

This section of the report will examine the likely impact of the existing ambient noise climate at the site upon the proposed new residential building. The main source of noise affecting the site is considered to be road traffic.

As stated before, Camden London Borough Council's Development Policy 28 sets out the noise conditions under which development may be granted planning permission; these requirements are presented in 0.

Regarding internal ambient noise levels in sensitive spaces (such as bedrooms or living rooms), at the time of writing no information was available with regards to Camden London Borough Council's required internal ambient noise conditions for residential developments. Therefore, the guidance in BS 8233:2014 has been used to determine a glazing performance specification which should achieve suitable internal noise levels. Maximum noise levels have also been considered in this assessment to take account of potential disturbance as a result of aircraft pass by events; this guidance is summarised in Section 3.4 of this report.

Plant noise limits were calculated based on the Local Authority requirements presented in Section 0.

5.1 Camden London Borough Council's requirements - Noise level on residential sites adjoining railways and roads

Below is a table comparing the requirements of Camden London Borough Council, for sites adjoining roads, against the levels measured on site.

Location	Period	Planning Not Granted $L_{Aeq,T}$ in dB	Attenuation required $L_{Aeq,T}$ in dB	Measured $L_{Aeq,T}$ in dB
1	Day (07:00 - 19:00)	≥ 72	≥ 62	57
	Evening (19:00 - 23:00)	≥ 72	≥ 57	45
	Night (23:00 – 07:00)	≥ 66	≥ 52	50
2	Day (07:00-19:00)	≥ 72	≥ 62	54

It can be seen from the table above, that the levels measured at the site are below those at which planning permission would be refused or attenuation measures required. Therefore according to the requirements of Camden London Borough Council, this would suggest that the site is suitable for residential development.

Although it is unlikely that any specific noise mitigation measures will be required to achieve appropriate noise levels in the proposed development, the following section will identify performance criteria for façade and glazing elements based on the guidance for internal ambient noise levels in BS 8233.

5.2 Glazing and Ventilation Requirements

Noise levels measured at positions UP1 and AP1 are considered representative of those which will be experienced on 24 Redington Gardens building façades. From these measurement results it is possible to determine the level of sound reduction that is likely to be required by the facades so as to meet the design targets. As noise levels do not appear to vary significantly across the site, glazing and ventilation specifications will be based on the noisiest façade. Therefore, the glazing performance recommendations below are judged to be valid for all facades of the building.

It has also been assumed that the building is to be mechanically ventilated and therefore there are no ventilation openings required in the building façade. However, where mechanical services systems are ducted to / from noisy facades it may be necessary to consider noise control measures (such as silencers). This should be investigated further at the detailed design stage.

The descriptor $R_w + C_{tr}$ is considered appropriate when specifying glazing; The C_{tr} weighting is useful when considering low-mid frequency noise such as that produced by road traffic or railway traffic at low speeds.

Table 7 summarises the attenuation requirements based on the free-field noise levels (L_{Aeq}) set out in the previous section. The requirements based on the maximum noise levels are also presented. This will result in two attenuation values, the highest should be selected to meet the most stringent design criteria, as summarised in Table 8.

It should be noted that façade element (glazing) performance has been based on broadband calculations and a number of typical worst case assumptions. In addition these calculations have been verified using octave band frequency based noise predictions. This is considered an appropriate level of detail for a planning stage assessment. However, it is recommended that at the design stage more detailed calculations are undertaken to establish façade performance requirements as it may be possible to reduce the required specification of the glazing elements.

Façade	Location	Design Target	Free-field Noise Level	Glazing attenuation $R_w + C_{tr}$ (dB) *
All	Living room	35 $L_{Aeq,16hour}$ Daytime	57 $L_{Aeq,16hour}$ Daytime	25
	Dining room/area	40 $L_{Aeq,16hour}$ Daytime	57 $L_{Aeq,16hour}$ Daytime	25
	Bedroom	35 $L_{Aeq,16hour}$ Daytime	57 $L_{Aeq,16hour}$ Daytime	25
		30 $L_{Aeq,16hour}$ Night-time	50 $L_{Aeq,16hour}$ Night-time	23
		45 $L_{AFmax,inside}$ Night-time	64 L_{AFmax} Night-time	22
* Calculation in accordance with BS 8233:2014.				

Table 7 – Glazing performance

Table 8 below provides potentially suitable glazing specifications to meet the attenuation requirements outlined in the previous section, based on the most stringent criteria from the previous table.

Façade	Location	Attenuation Target $R_w + C_{tr}$ dB	Suggested Glazing Specification*
All	Living room	25	4 mm pane / 6-16 cavity / 4mm pane
	Dining room/area		
	Bedroom		
* Glazing performance values assumed in this report are based on information provided by the Pilkington website (accessed 21/10/2015). These values are for glazing within a sealed unit only. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing. Alternative glazing products may be suitable but should provide equal or greater sound insulation performance.			

Table 8 – Glazing attenuation and suggested specifications

This level of façade and glazing performance is likely to result in internal ambient noise levels that meet the BS 8233:2014 noise guideline vales.

It should be noted that glazing and ventilation elements are normally the weakest part of the façade in terms of its sound insulation performance. As a result the sound insulation performance of other building construction elements such as walls, roof, etc. have not been considered in this section of the report. However, this assumption should be reviewed during the detailed design of the scheme.

5.3 Calculation of Plant Noise Limits

As previously discussed, it is suggested that the plant noise limits should be set so that:

- The noise emission from new items of fixed services plant to be designed not to exceed 5 dB (10 dB if tonal or impulsive) below the background noise level [$L_{A90,T}$] at 1 metre external to a sensitive façade.

As detailed information about the proposed plant is currently not available it is difficult to accurately identify the 'character correction' that is likely to apply to the assessment. Therefore, noise limits are calculated for both situations, i.e. where noise emitted from the proposed plant and machinery will not contain tones or impulses and where noise emitted from the proposed plant and machinery will contain tones or impulses.

The following table summarises the process used to determine plant noise limits at the facade of the nearest noise-sensitive receptors to the proposed development.

Period	Typical $L_{A90,15min}$ dBA	Plant noise limit at façade of noise sensitive receptor L_{AeqT}	
		Not Tonal	Tonal/Impulsive
Day (07:00 - 23:00)	39	34	29*
Evening (19:00 – 23:00)	36	31	26*
Night (23:00 - 07:00)	31	26*	21*
* It should be noted that taking into account the guidance in BS 4142, in a city environment it is not usually considered necessary to control external noise from plant and equipment to below 30 dB as internal noise levels, even with windows open, will be approaching a level at which they are unlikely to be perceptible. Therefore, it may be that a lower cut off of 30 dB $L_{Aeq,T}$ is appropriate, however, this would need to be confirmed with the Local Authority.			

Table 9 – Calculation of limiting plant noise levels

The noise limits stated above should be used to select appropriate equipment and specify any noise attenuation measures required.

6. Conclusion

A noise survey and assessment has been undertaken for the proposed development at 24 Redington Gardens in West Hampstead, London. Existing noise levels at the site have been measured and compared to national and local noise policy in addition to relevant standards and guidance.

The results of the survey suggest that the site is suitable for residential development. An assessment of likely internal ambient noise levels has been undertaken and recommendations relating to glazing performance have been made based on meeting the guideline noise criteria contained in BS 8233: 2014.

Limiting noise levels for externally mounted services plant have been suggested, based on the requirements of Camden Council and the guidance in BS 4142:2014.

Vibration and ground-borne noise has not been assessed as there were judged to be no vibration sources close enough to the site to result in adverse impacts at sensitive receptors.

Appendix 1 – Acoustic terms, definitions and symbols

L_p in dB	Sound pressure Level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
L_{pA} in dB(A)	Sound pressure level of A-weighted sound pressure.
$L_{Aeq,T}$ in dB(A)	Value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval T, has the same mean square sound pressure as a sound under consideration whose level varies with time.
$L_{A90,T}$ in dB(A)	A-weighted sound pressure level obtained by using time-weighting “F” (Fast) that is exceeded for 90% of the time interval considered.
$L_{Amax,F}$ in dB(A)	Maximum A-weighted sound pressure level obtained by using time-weighting “F” (Fast) within a specified time period.
Ambient noise	Totally encompassing sound in a given situation at a given time usually being composed of sound from many sources near and far.
Specific noise	Component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source.
R_w in dB	Weighted sound reduction index - single number quantity of airborne sound insulation properties of building elements. It is the value, in decibels, of the reference curve at 500Hz after shifting it in accordance with the method specified in ISO 717-1.
C_{tr} in dB	Spectrum adaptation term - value, in decibels, to be added to the single number rating (e.g. R_w) to take account of the characteristics of particular sound spectra. C_{tr} spectrum adaptation term is used for the following types of noise sources: i) urban road traffic; ii) railway traffic at low speeds; iii) aircraft, propeller driven; iv) jet aircraft, large distance; v) disco music; vi) factories emitting mainly low and medium frequency noise.