

**Town and Country Planning Act 1990  
Town and Country Planning General Regulations 1992**

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(Ref: 510/17)

**Erection of three storey building to create 6 x 2-bed and 3 x 1-bed self- contained flats, with associated parking, cycle and bin stores, and landscaping involving demolition of existing builders yard**

**Land rear of Crescent Parade, Uxbridge Road, Hillingdon UB10 0LG**

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## **1. Introduction**

Michael Sugiura Limited have been commissioned by Planning & Consulting on behalf of Highgrade Properties Limited to carry out a noise impact assessment, which is required to be submitted to discharge a planning condition attached to planning permissions for the proposed development of land rear of Crescent Parade, Uxbridge Road, Hillingdon, London UB10 0LG.

The purpose of this noise assessment is to assess the impact of road traffic noise and to recommend a scheme for protecting the proposed development from road traffic noise to mitigate its effects and ensure that the amenity of the occupiers of the proposed residential housing is not adversely affected by road traffic noise.

## 2. The Nature, Measurement and Effect of Noise

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to measure the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB (A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels from say 60 dB (A) to 70 dB (A) would represent a doubling in 'loudness'. Similarly, a decrease in noise from 70 dB (A) to 60 dB (A) would represent a halving in 'loudness'. A change of 3 dB (A) is generally considered to be just perceptible<sup>1</sup>. **Table 2.1** details typical noise levels. An acoustic glossary is provided in **Appendix 1**.

**Table 2.1: Typical Noise Levels**

| Approximate Noise Level<br>(dB(A)) | Example                         |
|------------------------------------|---------------------------------|
| 0                                  | Limit of hearing                |
| 30                                 | Rural area at night             |
| 40                                 | Library                         |
| 50                                 | Quiet office                    |
| 60                                 | Normal conversation at 1 m      |
| 70                                 | In car noise without radio      |
| 80                                 | Household vacuum cleaner at 1 m |
| 100                                | Pneumatic drill at 1 m          |
| 120                                | Threshold of pain               |

### 3. Noise Policy and Assessment Criteria

#### 3.1 National Planning Policy Framework

The new National Planning Policy Framework (NPPF) (Ref.1) released in March 2012 has replaced the Planning Policy Guidance which previously covered planning and pollution control and new development in England. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.

One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser value, where consistent with other policies in the Framework. 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.

Paragraph 123 of the NPPF (Ref.1) states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts (see Explanatory Note to the Noise Policy Statement for England (DEFRA)) (Ref.2) on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts (see Explanatory Note to the Noise Policy Statement for England (DEFRA)) 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 use since they were established (Subject to the provisions of the Environmental Protection Act 1990 and other relevant law); 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.

Planning Policy Guidance Note 24 'Planning and Noise' (PPG 24) was previously the main guidance document with respect to acceptable noise levels for dwellings (now revoked by NPPF).

### 3.2 Noise Policy Statement England (NPSE)

The Noise Policy Statement for England (NPSE) (Ref.2) was developed by DEFRA and published in March 2010. The vision of the NPSE is to *'Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.'*

The NPSE aims to *'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'*

### 3.3 London Borough of Hillingdon Council Planning Permission

#### 3.3.1 The Development

Erection of three storey building to create 6 x 2-bed and 3 x 1-bed self- contained flats, with associated parking, cycle and bin stores, and landscaping involving demolition of existing builders yard.

#### 3.3.2 Noise related planning conditions (Noise)

London Borough of Hillingdon Council's planning permission dated 19<sup>th</sup> April 2016 (Application Ref.70895/APP/2015/4349 (Ref.3) planning conditions schedule lists the following condition related to noise as follows:

*Condition 9 Development shall not begin until a scheme for protecting the proposed development from road traffic noise has been submitted to and approved in writing the Local Planning Authority. All works which form part of the scheme shall be fully implemented before the development is occupied and thereafter shall be retained and maintained in good working order for so long as the building remains in use.*

*Reason: To ensure that the amenity of the occupiers of the proposed development is not adversely affected by road traffic noise in accordance with Policy OE5 Hillingdon Local Plan: Part 2 Saved UDP Policies (November 2012) and London Plan (2015) Policy 7.15*

*Condition 10 The development shall not begin until a scheme for the control of noise transmission between adjoining flats has been submitted to and approved in writing the Local Planning Authority. Thereafter the scheme shall be*

*implemented and retained and maintained in full compliance with the approved measures.*

*Reason: To ensure that the that the amenity of the occupiers of the proposed development is not adversely affected by road traffic noise in accordance with Policy OE3 Hillingdon Local Plan: Part 2 Saved UDP Policies (November 2012) and London Plan (2015) Policy 7.15*

### 3.4 British Standard BS 8233

BS 8233: Sound Insulation and Noise Reduction for Buildings – Code of Practice (Ref.4) and its replacement BS 8233 Guidance on Sound Insulation and Noise Reduction for Buildings (Ref.5) has a number of design criteria and limits for intrusive external noise. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and good listening conditions in other rooms. Those most appropriate to the residential environment are reproduced in **Table 3.1**.

**Table 3.1: Summary of Internal Noise Criteria: BS 8233**

| Criterion                                                | Typical situations | Good Level<br>$L_{Aeq,T}$ | Reasonable Level $L_{Aeq,T}$ | Reasonable Peak $L_{Amax}$ |
|----------------------------------------------------------|--------------------|---------------------------|------------------------------|----------------------------|
| <b>BS 8233</b><br>Reasonable resting/sleeping conditions | Living rooms       | 30                        | 40                           | -                          |
|                                                          | Bedrooms           | 30                        | 35                           | 45                         |

### 3.5 World Health Organisation Guidelines for Community Noise

The World Health Organisation (WHO) (Ref.6) has developed guidelines designed to minimise the adverse effects of noise. The guidelines relevant to residential noise exposure are detailed in **Table 3.2**. For each specific environment the stated noise levels are the maximum noise levels to avoid the health effect noted.

**Table 3.2: WHO Community Noise Guideline Values**

| Specific Environment          | Critical health effect(s)                                          | L <sub>Aeq</sub> dB | Time Base (hours) | L <sub>Amax</sub> (fast) dB |
|-------------------------------|--------------------------------------------------------------------|---------------------|-------------------|-----------------------------|
| Outdoor living area           | Serious annoyance, daytime and evening                             | 55                  | 16                | -                           |
|                               | Moderate annoyance, daytime and evening                            | 50                  | 16                | -                           |
| Dwelling, indoors             | Speech intelligibility and moderate annoyance, daytime and evening | 35                  | 16                | -                           |
| Inside bedrooms               | Sleep disturbance, night-time                                      | 30                  | 8                 | 45                          |
| Outside bedrooms              | Sleep disturbance, window open (outdoor values)                    | 45                  | 8                 | 60                          |
| Hospital, ward rooms, indoors | Sleep disturbance, night time                                      | 30                  | 8                 | 40                          |
|                               | Sleep disturbance, daytime and evenings                            | 30                  | 16                | -                           |

### 3.6 Noise Impact Matrix

The Noise Impact Matrix defines a set of parameters from which the magnitude of the impact of noise as a result of the development, on surrounding sensitive receptors, can be categorised. The Noise Impact Matrix parameters have been derived from guidance provided in BS 8233 (Ref.5) and the WHO guidelines (Ref.6).

The criteria used to determine the sensitivity of a receptor is given in **Table 3.3** below. In producing this criteria it is assumed that all buildings are naturally ventilated via partially open windows, giving 13 dB (A) of noise reduction from outside to inside. This is considered to represent a worst-case scenario.

**Table 3.3: Sensitivity of receptor to noise**

|        | High                                                                                 | Medium                                                                                                                            | Low                                                                                       | Negligible                                                                                       |
|--------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Humans | Receptors of greatest sensitivity to noise such as World Heritage Sites and churches | Noise sensitive receptors such as dwellings, hospitals, schools, places of quiet recreation and places of recognised tranquillity | Receptors with some sensitivity to noise such as offices, other workplaces and play areas | Receptors of very low sensitivity to noise or marginal to the zone of influence of the proposals |

The magnitude of the change in noise levels is considered using the criteria outlined in **Table 3.4** below. The relative and absolute changes are considered in parallel and the worst case taken. The relative levels are reproduced from the semantic scale found in the Department of Transport's 'Design Manual for Roads and Bridges' guidance document (Ref.7). The absolute noise levels are with reference to the recommendations for dwellings made in the World Health Organisation's 1999: Guidelines for Community Noise (Ref.6) and in BS 8233:2014 'Sound insulation and noise reduction for buildings (Ref.5).

**Table 3.4: Magnitude of change in noise levels**

|                                            | Large                                                                                                                                                                                                                                                                                                           | Medium                                                                                                                                              | Small                                | Negligible                              |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------------------|
| Relative change                            | Greater than 10 dB(A) change in sound level                                                                                                                                                                                                                                                                     | 5 to 9.9 dB(A) change in sound level                                                                                                                | 3 to 4.9 dB(A) change in sound level | 2.9 dB(A) or less change in sound level |
| Absolute change<br>– Adverse daytime       | If $b < 50$ dB $L_{Aeq,16hr}$ and $f \geq 55$ dB $L_{Aeq,16hr}$<br><br>If $f$ triggers entitlement to statutory sound insulation                                                                                                                                                                                | If $b < 50$ dB $L_{Aeq,16hr}$ and $50 \leq f < 55$ dB $L_{Aeq,16hr}$<br><br>If $50 \leq b < 55$ dB $L_{Aeq,16hr}$ and $f \geq 55$ dB $L_{Aeq,16hr}$ |                                      |                                         |
| Absolute change<br>– Adverse night-time    | If $b < 45$ dB $L_{Aeq,16hr}$ and $f \geq 45$ dB $L_{Aeq,16hr}$<br><br>If $b < 60$ dB $L_{Amax}$ and $f \geq 60$ dB $L_{Amax}$<br><br>If $b \geq 60$ dB $L_{Amax}$ but does not exceed 85 dB $L_{Amax}$ more than twice in a one hour period and $f \geq 85$ dB $L_{Amax}$ more than twice in a one hour period | If $b > 85$ dB $L_{Amax}$ though not regularly and $f$ exceeds 85 dB $L_{Amax}$ more than twice in any one hour period                              |                                      |                                         |
| Absolute change<br>– Beneficial daytime    | If $b \geq 55$ dB $L_{Aeq,16hr}$ and $f < 50$ dB $L_{Aeq,16hr}$                                                                                                                                                                                                                                                 | If $50 \leq b < 55$ dB $L_{Aeq,16hr}$ and $f < 55$ dB $L_{Aeq,16hr}$<br><br>If $b \geq 55$ dB $L_{Aeq,16hr}$ and $50 \leq f < 55$ dB $L_{Aeq,16hr}$ |                                      |                                         |
| Absolute change<br>– Beneficial night-time | If $b \geq 45$ dB $L_{Aeq,16hr}$ and $f < 45$ dB $L_{Aeq,16hr}$<br><br>If $b \geq 60$ dB $L_{Amax}$ and $f < 60$ dB $L_{Amax}$                                                                                                                                                                                  |                                                                                                                                                     |                                      |                                         |

Note: “b” denotes for the existing or future baseline noise levels and “f” stands for the predicted future noise levels.

Finally to determine the overall noise impact the magnitude and sensitivity criteria are combined into a Degree of Effect matrix as shown in **Table 3.5** below, with the corresponding descriptors in **Table 3.6**.

**Table 3.5: Degree of Effect Matrix**

|                           |            | Importance/sensitivity of receptor |             |          |            |
|---------------------------|------------|------------------------------------|-------------|----------|------------|
|                           |            | High                               | Medium      | Low      | Negligible |
| Magnitude/scale of change | Large      | Very Substantial                   | Substantial | Moderate | None       |
|                           | Medium     | Substantial                        | Substantial | Moderate | None       |
|                           | Small      | Moderate                           | Moderate    | Slight   | None       |
|                           | Negligible | None                               | None        | None     | None       |

**Table 3.6: Degree of Effect Matrix Descriptors**

| Very Substantial     | Greater than 10 dB $L_{Aeq}$ change in sound level perceived at a receptor of great sensitivity to noise                                                                                  |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Substantial          | Greater than 5 dB $L_{Aeq}$ change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB $L_{Aeq}$ change in sound level at a receptor of great sensitivity to noise             |
| Moderate             | A 3 to 4.9 dB $L_{Aeq}$ change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB $L_{Aeq}$ change in sound level at a receptor of some sensitivity |
| Slight               | A 3 to 4.9 dB $L_{Aeq}$ change in sound level at a receptor of some sensitivity                                                                                                           |
| None/Not Significant | Less than 2.9 dB $L_{Aeq}$ change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals                        |

## 4. Baseline Noise Climate

In order to determine the extent to which the land rear of Crescent Parade is currently affected by road traffic noise, a detailed noise measurement study has been carried out at the site. Noise measurements have been carried out in order to characterise the ambient noise climate for the daytime and night time periods. Noise measurement procedures were in accordance with BS7445:2003 “Description and Measurement of Environmental Noise (Ref.8).

### 4.1 Semi-Permanent Noise Monitoring 2017

The noise measurements utilised a Nor-140 Sound Analyser, which holds a current certificate of calibration. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits ( $\pm 0.5$  dB). The weather was dry, with large amounts of sunshine with light winds ( $<2$  m/s) and a temperature of between  $7^{\circ}\text{C}$  -  $14^{\circ}\text{C}$ . Noise levels were continuously recorded between 11:00 hrs on Wednesday 1<sup>st</sup> November – 13:00 hrs on Thursday 2<sup>nd</sup> November in order to characterise the local noise climate at one location (P1) on the site during the day time and night time periods. It should be noted that there was activity in the Builders yard during the daytime monitoring periods. The noise monitoring position was selected to ensure it was at the greatest distance from the areas of loading and unloading of builders materials activity on the northern site boundary during the permitted hours 730am to 530pm. The semi-permanent noise monitoring position P1 was 1.6m above the roof of the existing Builders Yard offices and is shown on a site layout plan in **Figure 1**. This position is approximately 50m from Uxbridge Road and 50m from Long Lane.

The “free-field” noise levels from the semi-permanent noise monitoring position are summarised in **Table 4.1** below and the full results for 24hrs are shown in **Appendix 2** and Chart 1.

**Table 4.1 Sound Levels at P1 on land at rear of Crescent Parade, Hillingdon**

|       | LAeq | LAFmax | LA10 | LA90 |
|-------|------|--------|------|------|
| 11:01 | 61.6 | 89.1   | 63.6 | 53.0 |
| 12:01 | 59.4 | 81.8   | 62.7 | 52.8 |
| 13:01 | 62.1 | 87.8   | 63.4 | 52.7 |
| 14:01 | 63.2 | 91.3   | 65.6 | 53.3 |
| 15:01 | 61.4 | 86.9   | 64.5 | 52.5 |
| 16:02 | 63.4 | 86.6   | 63.1 | 52.8 |
| 17:02 | 55.0 | 75.0   | 56.5 | 51.5 |
| 18:02 | 55.9 | 79.5   | 57.0 | 51.7 |
| 19:02 | 55.0 | 72.7   | 56.8 | 51.0 |
| 20:02 | 56.7 | 80.9   | 58.7 | 50.4 |
| 21:02 | 54.0 | 76.3   | 56.1 | 49.3 |
| 22:02 | 53.2 | 69.0   | 56.0 | 48.2 |
| 23:02 | 51.5 | 67.4   | 54.7 | 46.0 |
| 00:02 | 49.9 | 70.2   | 53.0 | 42.9 |
| 01:02 | 48.4 | 73.7   | 51.0 | 41.8 |
| 02:02 | 46.7 | 63.0   | 49.2 | 41.8 |
| 03:03 | 47.4 | 75.6   | 49.6 | 41.1 |
| 04:03 | 49.0 | 62.5   | 52.3 | 42.8 |
| 05:03 | 52.6 | 68.4   | 55.9 | 46.6 |
| 06:03 | 57.1 | 72.2   | 58.9 | 52.9 |
| 07:03 | 64.4 | 90.7   | 65.3 | 55.3 |
| 08:03 | 62.1 | 91.8   | 64.0 | 54.9 |
| 09:03 | 61.7 | 90.3   | 61.5 | 55.1 |
| 10:03 | 63.8 | 89.1   | 66.1 | 53.9 |
| 11:03 | 63.5 | 88.0   | 66.1 | 53.5 |
| 12:03 | 63.6 | 89.6   | 65.8 | 53.3 |
| 13:03 | 63.0 | 85.3   | 64.7 | 52.0 |

## 4.2 Satellite Noise Monitoring 2017

Noise measurements were also carried out at a satellite noise monitoring position P2 approximately 30 metres from Uxbridge Road on Wednesday 1<sup>st</sup> November 2017 in order to establish traffic noise levels. The noise climate at the satellite noise monitoring positions was exposed to road traffic noise from Uxbridge Road and deliveries to the commercial premises in Crescent Parade. The satellite noise monitoring utilised a NTi XL2 handheld audio and acoustic analyser. The noise monitoring position P2 is shown on site layout plan in Figure 1.

The “free-field” noise levels from the satellite noise monitoring position are summarised in **Table 4.2** below and the full results for the 3-hour daytime period are presented in **Appendix 3**.

**Table 4.2 Sound Levels at P2 on land at rear of Crescent Parade, Hillingdon**

| Time     | Time     | LAeq | LAF90.0% | LAF10.0% |
|----------|----------|------|----------|----------|
| 12:30:00 | 12:45:00 | 56.0 | 51.3     | 57.4     |
| 12:45:00 | 13:00:00 | 59.1 | 52.4     | 63.5     |
| 13:00:00 | 13:15:00 | 53.7 | 51.3     | 55.2     |
| 13:15:00 | 13:30:00 | 59.3 | 52.7     | 63.1     |
| 13:30:00 | 13:45:00 | 57.7 | 51.3     | 63.1     |
| 13:45:00 | 14:00:00 | 54.2 | 50.8     | 55.5     |
| 14:00:00 | 14:15:00 | 54.9 | 50.9     | 56.2     |
| 14:15:00 | 14:30:00 | 54.6 | 50.6     | 56.5     |
| 14:30:00 | 14:45:00 | 62.0 | 54.7     | 65.1     |
| 14:45:00 | 15:00:00 | 54.3 | 51.0     | 55.8     |
| 15:00:00 | 15:15:00 | 58.5 | 51.0     | 62.4     |
| 15:15:00 | 15:30:00 | 57.8 | 51.1     | 58.8     |
| 15:30:00 | 15:45:00 | 55.9 | 52.1     | 58.2     |
| 15:45:00 | 16:00:00 | 61.0 | 50.0     | 64.0     |
| 16:00:00 | 16:00:02 | 51.7 | 50.9     | 52.2     |

## 5. Noise Level Predictions

### 5.1 Noise from Road Traffic

Traffic noise from Uxbridge Road and Long Lane affecting the development site has also been predicted using the methodology of the Technical Memorandum the 'Calculation of Road Traffic Noise' (CRTN) (Ref.9) to validate measurements. The noise levels calculated by this methodology are provided in the form of  $L_{A10, 18h}$  (dB). The A weighted equivalent day time sound pressure level ( $L_{Aeq, 16h}$ ) and the equivalent night-time sound pressure level ( $L_{Aeq, 8h}$ ) are then calculated from the CRTN levels by utilising the method developed by the Transportation Research Laboratory (TRL) in 'Converting the UK traffic noise index  $L_{A10, 18h}$  to EU noise indices for noise mapping'.

The results from the 2017 survey show that road traffic noise levels measured on the open site 4.0m above the ground  $L_{A10, 18hr}$  noise levels (Table 4.3) at 30m from Uxbridge Road and 50m from Long Lane are in the band of the  $L_{A10, 18h}$  55 to 60 dB(A) contour based on current day traffic conditions.

The conversion for  $L_{A10 (18hr)}$  to  $L_{Aeq (16hr)}$  is -2dB.

The estimated  $L_{Aeq, 16h}$  is representative of typical conditions daytime  $L_{Aeq, 16h}$  (07:00 – 23:00 hours) 60 dB(A) and Night-time  $L_{Aeq, 8h}$  (23:00 – 07:00 hours) 55 dB(A) across the site.

The Lden: Day-evening-night equivalent level

The A-weighted Leq noise level measured over the 24 hour period, with a 10dB penalty added to the levels between 23.00 and 07.00 hours and a 5 dB penalty added to the levels between 19.00 and 23.00 hours to reflect people's extra sensitivity to noise during the night and the evening is in the range 60-65 dB LAeq across the site.

The Ldn: Day-night equivalent level

The A-weighted Leq noise level measured over the 24 hour period, with a 10dB penalty added to the levels between 23.00 and 07.00 hours is in the range 50-55 dB LAeq.

## 6. Conclusions

This noise assessment has considered existing noise levels on land rear of Crescent Parade, Uxbridge Road, Hillingdon.

The site is capable of residential development that will meet the requirements of Hillingdon London Borough Council the Local Planning Authority and the scheme will be in accordance with National Planning Policy Framework (NPPF) paragraph 123 (Ref.1) and Noise Policy Statement for England (NPSE) (Ref.2).

Residential noise standards will be met in line with the latest technical advice. Internal noise criteria as set out in BS8233:2014 Sound Insulation and Noise Reduction for Buildings will be achieved (Ref.5).

The Master plan makes use of the layout of buildings on the Bow Wharf residential development to minimise the effect of traffic noise on the amenity of future residents. The build line of the properties is set back from Uxbridge Road in comparison to the neighbouring residential development. The layout shows dwellings and open spaces are shielded from both Uxbridge Road and Long Lane and that good use of internal layout is incorporated.

The noise assessment has assessed the likely levels of noise at the residential facades and considered the required façade acoustic performance based on achieving internal levels as advised in BS8233:2014 (Ref.5). Glazing and ventilator acoustic performance requirements are determined and specified.

The internal noise levels are however subject to detailed design of the building insulation including construction detailing, window specification and the overall insulation provided by the façade.

For the proposed development preliminary predictions by calculation of internal levels in living rooms and bedrooms as prescribed in Section 3 Table 3.1 for reasonable resting/sleeping conditions BS 8233:2014 should be achieved by the glazing and ventilation options highlighted in red.(lounge/kitchen) and in blue (bedrooms) in Appendix 4 glazing and ventilation options.

## References

1. National Planning Policy Framework
2. Noise Policy Statement England March 2010
3. London Borough of Hillingdon Council Planning Permission dated 19<sup>th</sup> April 2016  
Application Ref.70895/APP/2015/4349
4. BS 8233:1999 Sound Insulation and Noise Reduction for Buildings – Code of Practice
5. BS 8233:2014 Sound Insulation and Noise Reduction for Buildings
6. World Health Organisation “Guidelines for Community Noise” 1999
7. Department of Transports ‘Design Manual for Roads and Bridges’ Guidance Document
8. BS7445: 2003 Description and Measurement of Environmental Noise Parts 1-3
9. Department of Transport Welsh Office Calculation of Road Traffic Noise CRTN 1988

## Appendix 1: Glossary of Terms

| Term                          | Description                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>'A'-Weighting</b>          | <i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>                                                                                                                                                                                                                                                        |
| <b>Decibel (dB)</b>           | <i>This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>                                                                                                       |
| <b><math>L_{Aeq,T}</math></b> | <i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. <math>L_{Aeq,T}</math> can be measured directly with an integrating sound level meter.</i> |
| <b><math>L_{A10}</math></b>   | <i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the <math>L_{A10T}</math>. The <math>L_{A10}</math> is used to describe the levels of road traffic noise at a particular location.</i>                                                                                                                                     |
| <b><math>L_{A50}</math></b>   | <i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the <math>L_{A50T}</math>.</i>                                                                                                                                                                                                                                             |
| <b><math>L_{A90}</math></b>   | <i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the <math>L_{A90T}</math>. The <math>L_{A90}</math> is used to describe the background noise levels at a particular location.</i>                                                                                                                                          |
| <b><math>L_{Amax}</math></b>  | <i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>                                                                                                                                                                                                                                                                                                              |

**Appendix 2: Semi-Permanent Noise Measurements pdf**

**Appendix 3: Satellite Location Noise Measurements pdf**

## Appendix 4: Glazing and Ventilation Options

### Glazing Acoustic Specifications Options

Glazed elements, including all fixed and open able sections, related framework, mullions, transoms and, where applicable furniture, all as are intended within the front and rear façades, shall provide an airborne sound insulation index rating of not less than those shown below:

| Level over base | Example glazing configurations | Acoustic Performance |
|-----------------|--------------------------------|----------------------|
| <base level     | 4/12/4                         | R'w 31 dB            |
| +5 dB           | 4/12/4                         | R'w 31 dB            |
| +10 dB          | 4/12/10                        | R'w 36 dB            |
| +15 dB          | 6/12/10                        | R'w 38 dB            |
| +20 dB          | 10/12/16.8 laminate            | R'w 45 dB            |
| +25 dB          | 16.8/16/12.8 laminate          | R'w 51 dB            |

Performance shall be as measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1:1997, and evidence to this effect shall be published as part of the tender response. Elements as described above shall further offer not less than the minimum airborne sound reduction index (R) when measured in accordance with BS EN ISO 10140-2:2010 shown below:

| Glazing Acoustic Performance | Octave band centre frequency (Hz) |     |     |     |    |    |    |
|------------------------------|-----------------------------------|-----|-----|-----|----|----|----|
|                              | 63                                | 125 | 250 | 500 | 1k | 2k | 4k |
|                              | Sound reduction index (R), dB     |     |     |     |    |    |    |
| R'w 31 dB                    | 20                                | 24  | 20  | 25  | 35 | 38 | 35 |
| R'w 36 dB                    | 21                                | 25  | 22  | 33  | 40 | 43 | 44 |
| R'w 38 dB                    | 22                                | 26  | 27  | 34  | 40 | 38 | 46 |
| R'w 45 dB                    | 24                                | 28  | 32  | 43  | 46 | 48 | 55 |
| R'w 51 dB                    | 25                                | 34  | 41  | 47  | 53 | 60 | 68 |

## Ventilation Specification Options

Ventilators, including all fixed and open able sections and related framework, all as are intended to be included within the building, shall provide a weighted element-normalised level difference ( $D_{n,e,w}$ ) of not less than those shown below:

| Level over base | Ventilator                | Acoustic Performance |
|-----------------|---------------------------|----------------------|
| <base level     | Non-acoustic trickle vent | -                    |
| +5 dB           | Non-acoustic trickle vent | -                    |
| +10 dB          | Trickle vent              | 37 dB $D_{n,e,w}$    |
| +15 dB          | Through the wall vent     | 47 dB $D_{n,e,w}$    |
| +20 dB          | Through the wall vent     | 47 dB $D_{n,e,w}$    |
| +25 dB          | Through the wall vent     | 55 dB $D_{n,e,w}$    |
| +30 dB          | Through the wall vent     | 55 dB $D_{n,e,w}$    |

Performance shall be as measured in accordance with BS EN 20140-10:1992 and rated in accordance with BS EN ISO 717-1:1997, and evidence to this effect shall be published as part of the tender response.

Elements as described above shall offer not less than the minimum element-normalised level difference ( $D_{n,e}$ ) when measured in accordance with BS EN 20140-10:1992 shown below.

| Ventilation<br>Acoustic<br>Performance | Octave band centre frequency<br>(Hz)                |     |     |     |    |    |    |
|----------------------------------------|-----------------------------------------------------|-----|-----|-----|----|----|----|
|                                        | 63                                                  | 125 | 250 | 500 | 1k | 2k | 4k |
|                                        | Element-Normalised Level Difference, $D_{n,e}$ (dB) |     |     |     |    |    |    |
| 37 dB $D_{n,e,w}$                      | 36                                                  | 36  | 37  | 37  | 34 | 37 | 37 |
| 40 dB $D_{n,e,w}$                      | 29                                                  | 29  | 28  | 36  | 44 | 44 | 44 |
| 47 dB $D_{n,e,w}$                      | 39                                                  | 39  | 34  | 43  | 55 | 60 | 60 |
| 55 dB $D_{n,e,w}$                      | 40                                                  | 47  | 46  | 49  | 56 | 66 | 75 |