# Tottenham Mews
# London

## Environmental Noise Survey and Acoustic Design Statement Report

27931/ADS1.Rev1

12 November 2020

For:
Central London Commercial Estates

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## Document Control

| Rev | Date | Comment | Prepared by | Authorised by |
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| 2 | 12/11/2020 | Changes to cover and introduction. |  |  |
| | | | Daniel Stuart<br>Consultant<br>BSc(Hons) AMIOA | Andrew Fermer<br>Director<br>BSc(Hons) MIOA |
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| | | | | |

Hann Tucker Associates

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## Contents



## Attachments

# 1.0 Introduction

A residential development is proposed on Tottenham mews.

Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey and noise impact assessment in order to assess the suitability of the site for residential use.

This report presents the methodology and findings of our noise survey and assessment in the context of national planning policies and the policy of the Local Authority.

# 2.0 Objectives

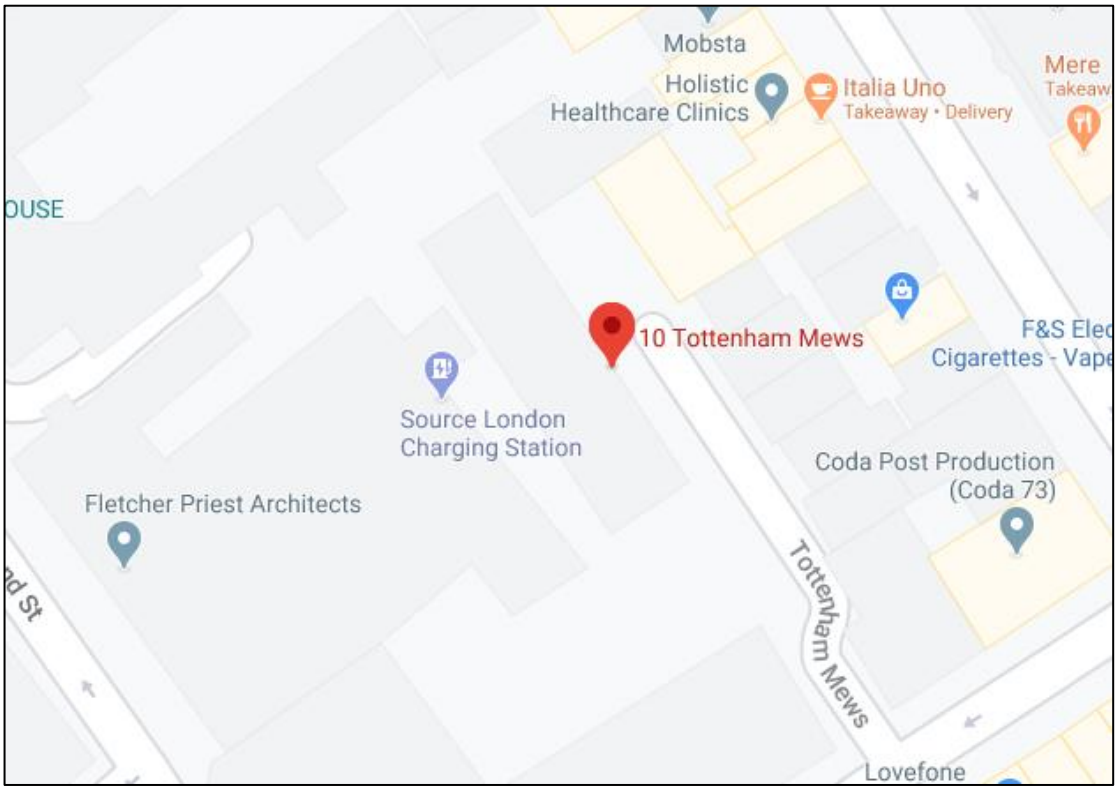
To establish by means of a detailed noise survey of the existing $L_{Amax}$, $L_{A10}$, $L_{Aeq}$ and $L_{A90}$ environmental road, rail and air traffic noise levels at up to 2No. secure and accessible on-site positions, using fully computerised unmanned monitoring equipment.

Based on the results of the survey, to undertake a noise assessment to assess the suitability of the site for residential use in accordance with the Noise Policy Statement for England (NPSE), National Planning Policy Framework (NPPF), Planning Practice Guidance (ProPG), British Standard BS8233:2014 and Local Authority requirements.

# 3.0 Site Description

## 3.1 Location

The site is located on Tottenham Mews. The location is shown in the Location Map below.



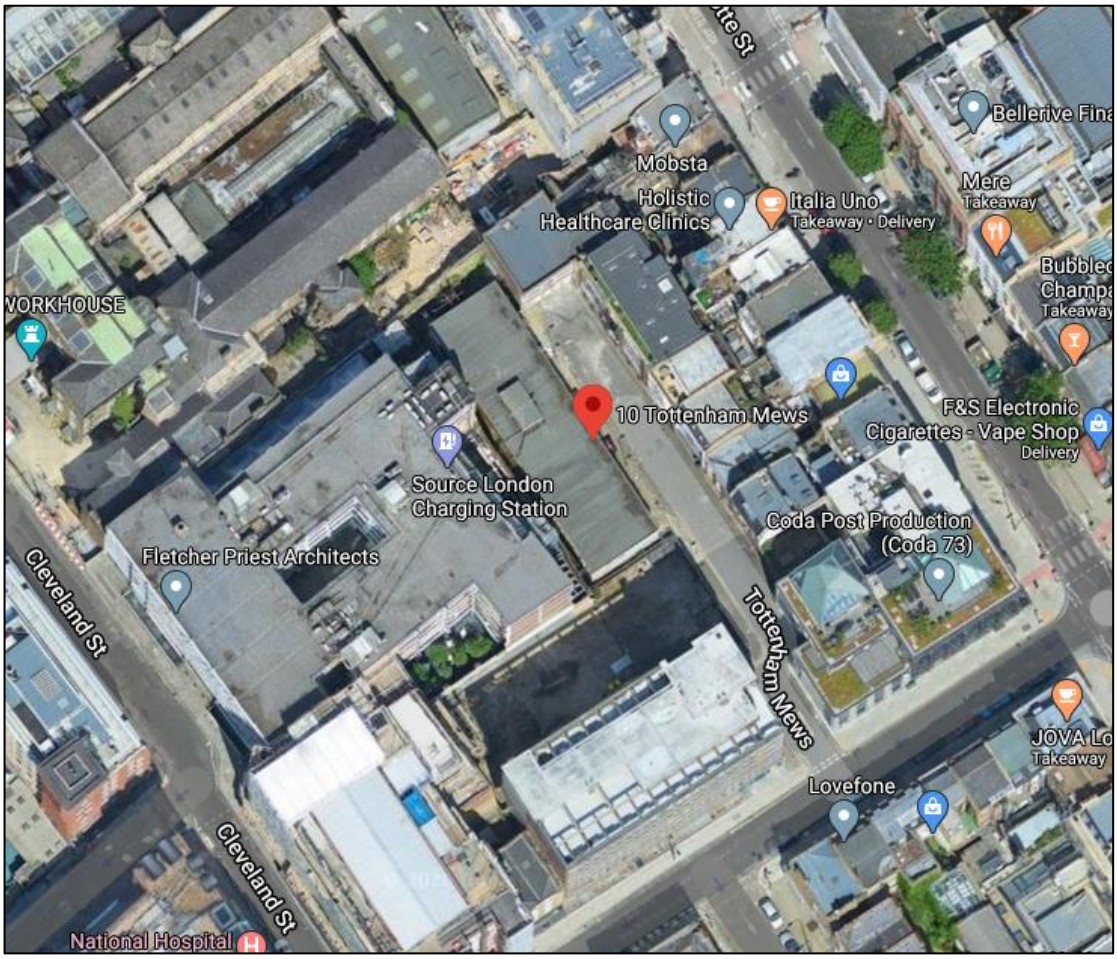
Location Map (Map data ©2020 Google)

The site falls within the jurisdiction of Camden Council.

## 3.2 Description

The site comprises a temporary prefabricated building dating from the 1970s, which is located on the western side of Tottenham Mews. The building is currently vacant and is soon to be demolished by the Applicant to allow the site to be utilised to facilitate the construction of the approved scheme at Middlesex Hospital Annex.

The eastern side of the mews is occupied by a series of individual mews buildings of varied design which are predominantly 4 storeys high from the ground level (several with additional half basements). The mews is accessed from the south from Tottenham Street.



Site Plan (Imagery ©2020 Bluesky, CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2020)

## 4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

## 5.0 Methodology

The survey was undertaken James Hardacre.

### 5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 13:00 hours on 14 July 2020 to 11:30 hours on 17 July 2020 and from approximately 13:00 hours on 21 July 2020 to 13:00 hours on 22 July 2020.

During the periods we were on site the wind conditions were calm. The sky was generally overcast. We understand that generally throughout the survey period the weather conditions

were similar to those observed while on site. These conditions are considered suitable for obtaining representative measurement results.

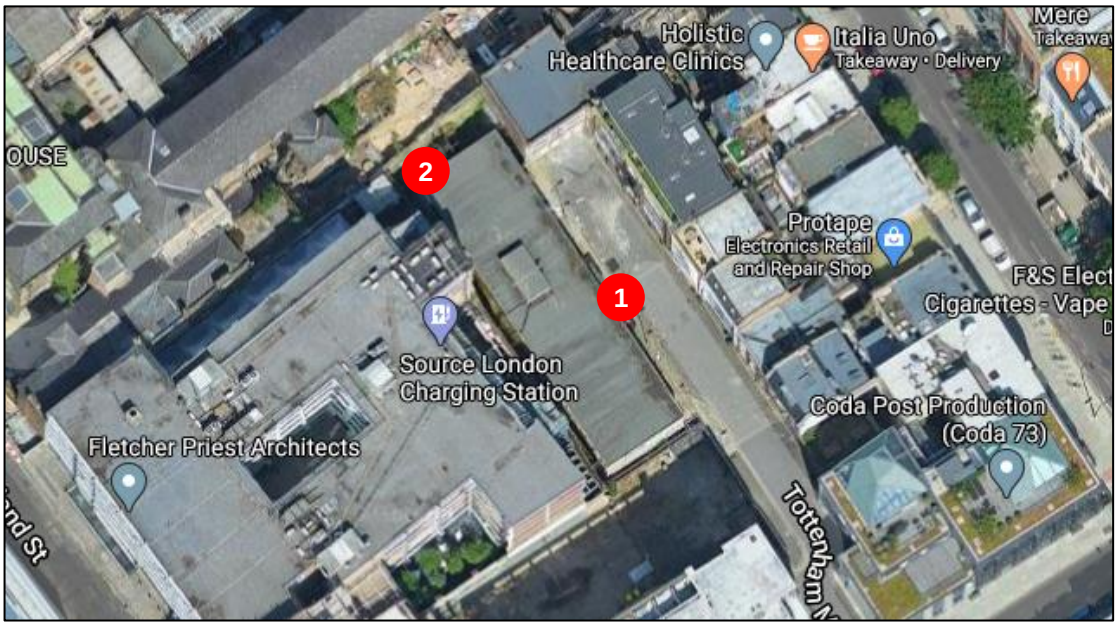
Measurements were taken continuously of the A-weighted (dBA) $L_{90}$, $L_{eq}$ and $L_{max}$ sound pressure levels over 15 minute periods.

## 5.2 Measurement Positions

The noise level measurements were undertaken at 2 positions as described in the table below.

| Position No | Description |
|---|---|
| 1 | The sound level meter was installed inside a small security box with the microphone protruding approximately 6cm out of the box.<br><br>The security box was fixed to a lamp post on Tottenham Mews (on the side facing the road) with the microphone at a height of approximately 4m above ground level.<br><br>In order to minimise the effect of the box, the microphone was orientated vertically downwards such that it was not screened from the road. |
| 2 | The microphone was placed at the rear of the site up a single flight of outdoors stairs approximately 5m above ground level and at least 1.5m from the nearest reflecting surface. |

The positions are shown on the plan below.




Plan Showing Unmanned Measurement Positions (Imagery ©2020 Bluesky, CNES / Airbus, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2020)

## 5.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

| Description | Manufacturer | Type | Serial Number | Calibration |
|---|---|---|---|---|
| Position 1<br>Type 1<br>½" Condenser<br>Microphone | PCB | 377B02 | 132146 | Calibration on<br>11/07/2019 |
| Position 1<br>Preamp | Larson Davis | PRM902 | 4215 | Calibration on<br>11/07/2019 |
| Position 1<br>Type 1<br>Data Logging<br>Sound Level Meter | Larson Davis | 824 | 3838 | Calibration on<br>11/07/2019 |
| Position 2<br>Type 1<br>½" Condenser<br>Microphone | PCB | 377A02 | 101926 | Calibration on<br>29/06/2020 |
| Position 2<br>Preamp | Larson Davis | PRM902 | 3949 | Calibration on<br>29/06/2020 |
| Position 2<br>Type 1<br>Data Logging<br>Sound Level Meter | Larson Davis | 824 | 3701 | Calibration on<br>29/06/2020 |

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

# 6.0 Results

The results have been plotted on Time History Graphs 27931/TH1.1 to 27931/TH1.2 enclosed presenting the 15 minute A-weighted (dBA) $L_{90}$, $L_{eq}$ and $L_{max}$ levels at each measurement position throughout the duration of the survey.

The following table presents the lowest measured $L_{A90}$ background noise levels during the survey:

| Position | Lowest Measured $L_{A90}$ Background Noise Level (dB re 2 x $10^{-5}$ Pa) | |
|---|---|---|
| | Daytime (07:00 – 23:00) Hours | Night-Time (23:00 – 07:00) Hours |
| 1 | 45 | 45 |
| 2 | 43 | 43 |

The following table presents the modal average of the measured $L_{A90}$ background noise levels during the survey:

| Position | Modal Average Measured $L_{A90}$ Background Noise Level (dB re 2 x $10^{-5}$ Pa) | |
|---|---|---|
| | Daytime (07:00 – 23:00) Hours | Night-Time (23:00 – 07:00) Hours |
| 1 | 46 | 45 |
| 2 | 45 | 44 |

The following table presents the measured $L_{Aeq,T}$ noise levels during the survey:

| Position | Measured $L_{Aeq,T}$ Noise Level (dB re 2 x $10^{-5}$ Pa) | |
|---|---|---|
| | Daytime (07:00 – 23:00) Hours, $L_{Aeq,16hr}$ | Night-Time (23:00 – 07:00) Hours, $L_{Aeq,8hr}$ |
| 1 | 56 | 47 |
| 2 | 67 | 47 |

# 7.0 Discussion of Noise Climate

During the periods we were on site the dominant noise sources were noted to be noise from the local road network and noise from active local construction sites.

# 8.0 Relevant Planning Policies and Guidance

## 8.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

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

That vision is supported by the following NPSE noise policy aims which are reflected in three of the four aims of planning policies and decisions in paragraph 123 of the NPPF (see paragraph 8.2 (b) below):

*"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."*

The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

**NOEL – No Observed Effect Level**
This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

**LOAEL – Lowest Observable Adverse Effect Level**
This is the level above which adverse effects on health and quality of life can be detected.

**SOAEL – Significant Observed Adverse Effect Level**
This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding

principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

## 8.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (revised February 2019):

"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Paragraph 180 also references the Noise Policy Statement for England. This document does not refer to specific noise levels but instead sets out three aims:

"Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

## 8.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at http://planningguidance.planningportal.gov.uk/blog/guidance/. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:

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

## 8.4 The London Plan (2016)

The London Plan, published in 2011 with minor revisions in 2013, 2015 and 2016, provides an overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. The Plan brings together the Mayor's strategies, including policy on a range of environmental issues, such as climate change, air quality, noise and waste. London boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

Policy 7.15 specifically relates to noise and states:

*"Development proposals should seek to reduce noise by:*

a) *Minimising the existing and potential; adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*
b) *Separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation;*
c) *Promoting new technologies and improving practices to reduce noise at source."*

**London Plan – Housing Supplementary Planning Guidance**

The Housing SPG 2016 highlights the elements of the London Plan that are relevant to housing development, and where applicable, provides more detail. The SPG states:

*"Noise – Baseline*

*Standard 5.3.1 (and Policy 7.15) – The layout of adjacent dwellings and the location of lifts and circulation spaces should seek to limit the transmission of noise to sound sensitive rooms within dwellings.*

*Policy 7.15 Reducing Noise and Enhancing Soundscapes requires development proposal to seek to reduce noise and manage the effects of noise. It is another important aspect of retreat and privacy in a dwelling. Noise from the street and adjoining properties can cause stress, sleep disturbance and friction between neighbours as recognised in the NPPF154.*

*2.3.35 All dwellings should be built with acoustic insulation and tested to current Building Regulations standards 155. However, acoustic insulation should not be relied upon as the only means of limiting noise and the layout and placement of rooms within the building should be*

*considered at an early stage in the design process to limit the impact of external noise on bedrooms and living rooms. The impact of noise should also be considered in the placement of private external spaces."*

## 8.5 The Draft New London Plan (2019 Draft)

This is a new London Plan (also known as a Replacement Plan). This means it is not an alteration or update to previous London Plans. This new London Plan, once published will be the third London Plan, the previous ones being the 2004 London Plan produced by former Mayor of London Ken Livingstone and the 2011 London Plan produced by former Mayor of London Boris Johnson. All of the other iterations of the London Plan from 2004-2016 have been alterations. Once published adopted this London Plan will replace all previous versions.

Policy D13 Noise states:

A. *"In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

   1) *avoiding significant adverse noise impacts on health and quality of life*
   2) *reflecting the Agent of Change principle as set out in Policy D12.*
   3) *mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses.*
   4) *improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity).*
   5) *separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation.*
   6) *where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles.*
   7) *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

B. *Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.*

*3.13.1. The management of noise is about encouraging the right acoustic environment in the right place at the right time. This is important to promote good health and a good quality of life within the wider context of achieving sustainable development. The management of noise should be an integral part of development proposals and considered as early as possible. Managing noise includes improving and enhancing the acoustic environment and promoting appropriate soundscapes. This can mean allowing some places or certain times to become noisier within reason, whilst others become quieter. Consideration of existing noise sensitivity within an area is important to minimise potential conflicts of uses or activities, for example in relation to internationally important nature conservation sites which contain noise-sensitive species. Boroughs, developers, businesses and other stakeholders should work collaboratively to identify the existing noise climate and other noise issues to ensure effective management and mitigation measures are achieved in new development proposals.*

*3.13.2. The Agent of Change Principle places the responsibility for mitigating impacts from existing noise-generating activities or uses on the new development. Through the application of this principle existing land uses should not be unduly impacted affected by the introduction of new noise-sensitive uses. For noise-generating uses regard should be had to not prejudicing their potential for intensification or expansion.*

*3.13.3. The management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. The Institute of Acoustics has produced advice Pro:PG Planning and Noise (May 2017) that may assist with the implementation of residential developments. BS4214 provides guidance on monitoring noise issues in mixed residential/industrial areas.*

*3.13.4. Deliberately introducing sounds can help mitigate the adverse impact of existing sources of noise, enhance the enjoyment of the public realm, and help protect the relative tranquillity and quietness of places where such features are valued. For example, playing low-level music outside the entrance to nightclubs has been found to reduce noise from queueing patrons, leading to an overall reduction in noise levels. Water features can be used to reduce the traffic noise, replacing it with the sound of falling water, generally found to be more pleasant by most people.*

*3.13.5. Heathrow and London City Airport Operators have responsibility for noise action plans for airports. Policy T8 Aviation sets out the Mayor's approach to aviation-related development.*

*3.13.6. The definition of Tranquil Areas, Quiet Areas and spaces of relative tranquillity are matters for London boroughs. These are likely to reflect the specific context of individual boroughs, such that Quiet Areas in central London boroughs may reasonably be expected not to be as quiet as Quiet Areas in more residential boroughs. Defra has identified parts of Metropolitan Open Land and local green spaces as potential Quiet Areas that boroughs may wish to designate."*

## *8.6* London Plan Sustainable Design and Construction SPG

The London Plan Sustainable Design and Construction SPG provides additional information in the following key areas:

- The sources of noise;
- Ways to mitigate noise emitted by developments;
- Ways to mitigate the impact of noise on developments; and
- Some detailed design considerations.

## 8.7 Local Planning Policy

The site lies within London Borough of Camden's jurisdiction. Their advice regarding criteria for atmospheric noise emissions from building service plant is contained within their Local Plan, version June 2017 as follows:

### Industrial and Commercial Noise Sources

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

**Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)**

| Existing Noise sensitive receptor | Assessment Location | Design Period | LOAEL (Green) | LOAEL to SOAEL (Amber) | SOAL (Red) |
|---|---|---|---|---|---|
| Dwellings** | Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade) | Day | 'Rating level' 10dB* below background | 'Rating level' between 9dB below and 5dB above background | 'Rating level' greater than 5dB above background |
| Dwellings** | Outside bedroom window (façade) | Night | 'Rating level' 10dB* below background and no events exceeding 57dB$L_{Amax}$ | 'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dB $L_{Amax}$ | 'Rating level' greater than 5dB above background and/or events exceeding 88dB$L_{Amax}$ |

*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

**levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area.

On 26 June 2016 London Borough of Camden sent us an email confirming the following windows should be considered noise sensitive, *"housing, schools, hospitals, offices, workshops"*.

## 8.8 World Health Organisation

The current Environmental Noise Guidelines 2018 for the European Region (ENG) supersede the Guidelines for Community Noise from 1999 (CNG). Nevertheless, the ENG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) remain valid.

A summary of the guidance from the ENG and CNG is shown in the table below.

| Source | CNG guideline indoors all sources | ENG guideline outdoors noise from specific source only |
|---|---|---|
| Road traffic noise | 35 $L_{Aeq, 16h}$ | 53 dB $L_{den}$ |
| | 30 $L_{Aeq, 8h}$ | 45 dB $L_{night}$ |
| Railway noise | 35 $L_{Aeq, 16h}$ | 54 dB $L_{den}$ |
| | 30 $L_{Aeq, 8h}$ | 44 dB $L_{night}$ |
| Aircraft noise | 35 $L_{Aeq, 16h}$ | 45 dB $L_{den}$ |
| | 30 $L_{Aeq, 8h}$ | 40 dB $L_{night}$ |

With regard to single-event noise indicators, Section 2.2.2 of the WHO Environmental Noise Guidelines 2018 state:

*"In many situations, average noise levels like the $L_{den}$ or $L_{night}$ indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ($L_{A,max}$) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by $L_{A,max}$. Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators."*

## 8.9 British Standard BS8233: 2014

British Standard 8233: 2014 "Guidance on sound insulation and noise reduction for buildings" provides guidance for the control of noise in and around buildings.

### 8.9.1 Internal Areas

BS8233:2014 Section 7.7.2 titled "Internal ambient noise levels for dwellings" states:

*"In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:*

| *Activity* | *Location* | *Desirable Internal Ambient Criteria* | |
|---|---|---|---|
| | | *07:00 – 23:00* | *23:00 to 07:00* |
| *Resting* | *Living Rooms* | *35 dB $L_{Aeq,16hour}$* | *-* |
| *Dining* | *Dining Room/Area* | *40 dB $L_{Aeq,16hour}$* | *-* |
| *Sleeping (Daytime Resting)* | *Bedroom* | *35 dB $L_{Aeq,16hour}$* | *30 dB $L_{Aeq,8hour}$* |

*Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.*

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

*Note 3 These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks nigh or News Year's Eve.*

*Note 4 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.*

*Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*

*If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.*

*Note 6 Attention is drawn to the Building Regulations.*

*Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

### 8.9.2 External Amenity Areas

BS823:2014 Section 7.7.3.2 titled "Design criteria for external noise" states:

*"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$[1], with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*

*Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens, and terraces, which might be intended to be used for relaxation. In high-noise areas consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."*

## 8.10 ProPG : Planning & Noise : 2017

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

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

**8.10.3** The two sequential stages of the overall approach are:

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

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

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

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

| Activity | Location | 07:00 – 23:00 Hours | 23:00 – 07:00 Hours |
|---|---|---|---|
| Resting | Living Room | 35dB $L_{Aeq,16hr}$ | - |
| Dining | Dining Room / Area | 40dB $L_{Aeq,16hr}$ | - |
| Sleeping (daytime resting) | Bedroom | 35dB $L_{Aeq,16hr}$ | 30dB $L_{Aeq,16hr}$ |

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

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

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

*NOTE 4 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. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).*

*NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal $L_{Aeq}$ target levels should not normally be exceeded, subject to the further advice in Note 7.*

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

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

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue).

## 9.0 Proposed Design Target Internal Noise Levels

On the basis of BS8233:2014 we propose the following internal noise levels be adopted as design targets in the proposed habitable rooms:

| Activity | Location | Desirable Internal Ambient Criteria | |
|---|---|---|---|
| | | 07:00 – 23:00 | 23:00 to 07:00 |
| Resting | Living Rooms | 35 dB $L_{Aeq,16hour}$ | - |
| Dining | Dining Room/Area | 40 dB $L_{Aeq,16hour}$ | - |
| Sleeping (Daytime Resting) | Bedroom | 35 dB $L_{Aeq,16hour}$ | 30 dB $L_{Aeq,8hour}$ |

Note: For this site the $L_{Aeq,T}$ noise parameter alone is considered to be sufficient given the character of the noise climate we have measured. This is consistent with Section 2.2.2 of The World Health Organisation Environmental Noise Guidelines for the European Region and Note 4 of Section 7.7.2 of BS8233:2014)

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target noise levels may be relaxed (subject to the requirements of any planning conditions) by up to 5 dB and reasonable internal conditions still achieved.

## 10.0 Achievable Internal Noise Levels

We have predicted the levels that would be achievable in the worst-case dwellings with windows partially opened and also with windows closed.

## 10.1 Windows Partially Open

It is generally accepted that the typical noise reduction achieved with partially opened windows is around 15dBA (ref. BS 8233:2014 Annex G.1). This value is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.

A simple assessment thus indicates the following noise levels may be expected within the proposed worst case habitable rooms with partially opened windows.

| Description | Predicted Worst Case Internal Noise Levels with Windows Partially Opened | | | |
|---|---|---|---|---|
| | Position 1 | | Position 2 | |
| | Daytime $L_{Aeq(16\text{-hour})}$ | Night-time $L_{Aeq(8\text{-hour})}$ | Daytime $L_{Aeq(16\text{-hour})}$ | Night-time $L_{Aeq(8\text{-hour})}$ |
| External free field level | 56dBA | 47dBA | 67dBA | 47dBA |
| Façade correction | +3dBA | +3dBA | +3dBA | +3dBA |
| Façade noise level | 59dBA | 50dBA | 70dBA | 50dBA |
| Noise reduction for conventional thermal double glazing | -15dBA | -15dBA | -15dBA | -15dBA |
| Predicted internal noise levels | 44dBA | 35dBA | 55dBA | 35dBA |

## 10.2 Windows Closed

It is generally accepted that the typical noise reduction achieved by double glazing is in the range of 33dBA to 37dBA for road traffic noise. These values are taken from based on guidance contained within BS8233, ProPG24 and BS6262 and is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.

A simple assessment thus indicates the following noise levels may be expected within the proposed worst case dwellings with double glazing.

| Description | Predicted Worst Case Internal Noise Levels with Windows Closed | | | |
|---|---|---|---|---|
| | Position 1 | | Position 2 | |
| | Daytime $L_{Aeq(16\text{-}hour)}$ | Night-time $L_{Aeq(8\text{-}hour)}$ | Daytime $L_{Aeq(16\text{-}hour)}$ | Night-time $L_{Aeq(8\text{-}hour)}$ |
| External free field level | 56dBA | 47dBA | 67dBA | 47dBA |
| Façade correction | +3dBA | +3dBA | +3dBA | +3dBA |
| Façade noise level | 59dBA | 50dBA | 70dBA | 50dBA |
| Noise reduction for suitable double glazing | -35dBA | -35dBA | -35dBA | -35dBA |
| Predicted internal noise levels | 24dBA | 15dBA | 35dBA | 15dBA |

## 11.0 Mitigation Measures

The predicted worst case internal noise levels with windows closed meet the proposed criteria. It is thus demonstrated that acceptable internal noise levels are achievable with conventional double glazing.

The predicted worst case internal noise levels with windows partially opened exceed the proposed target levels (as is often the case). The minimum mitigation available to future occupants would be to close their window. Ventilation (incorporating suitable acoustic attenuation) will be provided to comply with the requirements of the Building Regulations Approved Document F whole dwelling ventilation. The occupants will thus have the option of keeping windows closed for most of the time and opening windows for purge ventilation.

This form of mitigation is supported within the Pro:PG which advises the following:

2.34 Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with façade openings used to provide *"whole dwelling ventilation"* in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal $L_{Aeq}$ target noise levels should not generally be exceeded.

2.35 It should also be noted that the internal noise level guidelines are generally not applicable under *"purge ventilation"* conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

At this stage of the design scheme the precise details of window to be used are not known, nor are the precise details of the ventilation.

The external envelope of the proposed residences will incorporate suitably specified glazing so as to achieve the proposed design target internal noise levels presented above.

Where ventilation is provided through the façade it shall be suitably acoustically attenuated to ensure the achievement of the proposed target internal noise levels is not compromised.

The Local Planning Authority may expect to be provided with details of the sound insulation treatments when available. Therefore in granting consent it would be appropriate for a planning condition to be imposed along the following lines, (based on the example condition 1 drawn from PPG24):

> *"Construction work shall not begin until a scheme for protecting the proposed [noise-sensitive development] from noise from the ……. has been submitted to and approved by the local planning authority; all works which form part of the scheme shall be completed before [any part of] the [noise-sensitive development] is occupied."*

## 12.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the site.

The environmental noise impact upon the proposed dwellings has been assessed in the context of national and local planning policies.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures. Mitigation advice, including the use of suitably specified glazing and acoustically attenuated ventilation, have been recommended to reduce to a

minimum the adverse impact on health and quality life arising from environmental noise.

The assessment shows the site, subject to appropriate mitigation measures, is suitable for residential development in terms of noise.

# Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — $L_{90}$ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

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

$L_p$ — Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of $2 \times 10^{-5}$ Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

$L_w$ — Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually $10^{-12}$ W).