

Arup**Acoustics**

Hampshire County
Council

**Shepherds Spring
Andover**

Assessment of the
Suitability of Noise
Climate for Residential
Development

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Andover**

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Climate for Residential
Development

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Arup Acoustics

Parkin House, 8 St Thomas Street, Winchester, Hampshire S023 9HE
Tel +44 (0)1962 829900 Fax +44 (0)1962 867270
www.arup.com/acoustics

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		Name	Rachel Capstick BSc MA AMIOA	Andy Officer MIOA AMIPRE	Greg Harris MSc MIOA
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		Name	Rachel Capstick BSc MA AMIOA	Andy Officer MIOA AMIPRE	Greg Harris MSc MIOA
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Executive Summary

An assessment of environmental noise has been carried out for the proposed development of residential properties at Shepherds Spring, Andover, Hampshire.

A background noise survey was undertaken at selected times of the day and night to establish ambient conditions and the results compared to the criteria in PPG 24 [1].

The measured noise levels show that the proposed residential areas should be rated as PPG 24 Noise Exposure Category (NEC) A - C.

Methods of mitigating these noise levels so as to maintain adequate noise conditions inside the proposed dwellings have been discussed.

1 Introduction

The proposal is to develop the former school playing field close to the junction of Newbury Road (A343) and Smannell Road, Andover, to build residential accommodation. The site is known as Shepherds Spring.

A noise survey was conducted to establish the existing noise levels during the day and night and to identify dominant noise sources. The noise levels measured were assessed in accordance with the guidance in Planning Policy Guidance Note 24 (PPG 24) in order to evaluate the suitability of the proposed site.

A glossary of terms is included as Appendix B.

1.1 Site Description

The proposed development site (Shepherds Spring), is the existing school playing field situated to the north of Smannell Road and to the east of Newbury Road (A343). Newbury Road is dual carriageway and forms the western boundary of the site. Neither Newbury Road or Smannell Road are particularly busy. The land to the north and east of the site is residential and is served by small quiet roads. A plan of the site is shown below in Figure 1.

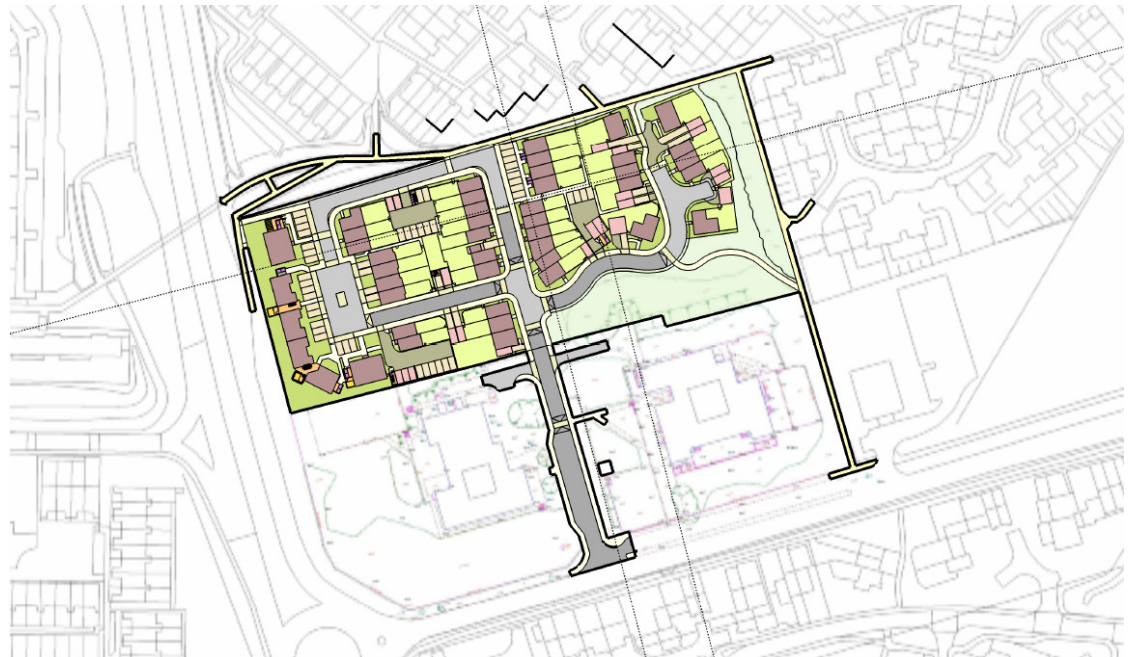


Figure 1: Site plan of Shepherds Spring, Andover

2 Noise Criteria

PPG24 offers guidance on the development of residential areas near to new or existing noise sources. It also defines noise exposure categories (NECs) for day and night time to assist in assessing whether or not it is appropriate to allow residential development for a given noise climate. The categories relate to different noise bands depending on the source of noise, whether from road, rail, air, or mixed noise sources. For this assessment, road traffic noise was considered dominant, hence the source category used throughout the assessment was 'road traffic'. During quiet periods distant rail noise could also be heard.

The noise exposure categories given in PPG24 are shown below in Table 1. The associated advice provided in PPG24 relating to the granting of planning permission for residential use is reproduced in Table 2.

Noise Levels ⁰ Corresponding to the Noise Exposure Categories for new dwellings				
L _{Aeq,T} dB				
Noise Exposure Category				
Noise source	A	B	C	D
Road Traffic				
07:00-23:00	<55	55-63	63-72	>72
23:00-07:00 ¹	<45	45-57	57-66	>66
Rail traffic				
07:00-23:00	<55	55-66	66-74	>74
23:00-07:00 ¹	<45	45-59	59-66	>66
Air traffic				
07:00-23:00	<57	57-66	66-72	>72
23:00-07:00 ¹	<48	48-57	57-66	>66
Mixed sources				
07:00-23:00	<55	55-63	63-72	>72
23:00-07:00 ¹	<45	45-57	57-66	>66

Table 1: Noise exposure categories for new dwellings near road traffic noise sources

- Noise Levels: the noise level (s) (L_{Aeq,T}) used when deciding the NEC of a site should be representative of typical conditions.
- Night time noise levels (23:00-07:00): sites where individual noise events regularly exceed 82dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the L_{Aeq,8hr} (except where the L_{Aeq,8hr} already puts the site in NEC D).

NEC A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
NEC B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
NEC C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
NEC D	Planning permission should normally be refused.

Table 2: Definitions of noise exposure categories for new dwellings near existing noise sources

3 Noise Assessment Methodology

Measurements of both the daytime and night-time noise levels were made at appropriate locations across the site in order to calculate the noise exposure category to be used to assess the suitability of the site for development according to the PPG24 guidance.

Sample measurements were taken during the day to represent the daytime L_{Aeq,16hr} (07:00 - 23:00). The shortened measurement procedure described in the Calculation of Road Traffic Noise (CRTN) [2] was used to calculate the L_{A10,18hr} from the L_{A10,3hr}. This was then converted to an L_{Aeq,16hr} as described in PPG24.

Measurement of the night-time values was made by sampling between 23:00 and 03:00 and also by measuring during the evening traffic peak period. The evening traffic peak period noise level was used as an approximation of the early morning peak period traffic noise level (06:00 – 07:00). The noise climate was considered unlikely to change significantly between 03:00 and 06:00. The $L_{Aeq,8hr}$ value was calculated from these individual measurements.

4 Measurement Survey

The daytime noise measurement survey was conducted by Rachel Capstick of Arup Acoustics between 10:00 and 13:00 on 6 August 2008. The night-time noise measurement survey was conducted by James Beer of Arup Acoustics between 17:00 on 19 August 2008 and 03:00 on 20 August 2008.

For each noise measurement, the noise climate, wind speed and direction, and the measured noise levels, were all noted. The L_{A10} , L_{A90} , L_{Aeq} , and L_{Amax} noise parameters were recorded. The results are reported in Appendix A.

4.1 Measurement Procedure

The sound level meter (SLM) was mounted on a tripod at a height of 1.2 – 1.5m above the ground. All measurements were in a 'free field' condition, at least 3.5m from any vertically reflective surfaces. The three measurement locations were chosen to provide a representative indication of the typical ambient noise levels across the area proposed for residential development.

The weather conditions during the survey were dry and cloudy with wind speeds less than 5ms^{-1} generally from the west.

Measurements were taken for 15 minutes in each sampled hour for each of the four chosen locations during the daytime and night-time measurement period.

The instrumentation used to carry out the noise survey was as follows:

- Brüel & Kjær 2260 type 1 precision integrating sound level meter
- Brüel & Kjær Type 4231 Calibrator
- Kestrel 1000 Anemometer

Immediately before and after each series of measurements was carried out, the SLM's calibration was checked using the SPL calibrator.

All noise measuring instrumentation owned and used by Arup Acoustics is checked for correct calibration to traceable national and international standards on an annual basis. Routine 'in-house' spot checks are also carried out at regular intervals as part of Arup Acoustics' QA policy.

4.2 Measurement Location Descriptions

The measurement locations were selected to represent the east and west boundaries of the proposed residential development and the potentially different noise climates associated with each. Measurements were also taken in the centre of the site to give an indication of how the noise climate changed between the western position (location 1) which was closest to Newbury Road, and the eastern position (location 3) which was furthest from it.

4.2.1 Location 1

Measurement location 1 was close to the site boundary with Newbury Road and represented the facades of the proposed residences closest to Newbury Road.

During both the day and night-time measurements the dominant noise source was local road traffic noise. During quiet periods distant road traffic and distant rail noise could also be heard.

4.2.2 Location 2

Measurement location 2 was in the centre of the proposed development and represented the residences close to this location. It also served to give an indication of the changes in noise levels across the site.

During both the day and night-time measurements the dominant noise source was road traffic. Pedestrians using a footbridge and footpath adjacent to the site and rail noise could also be heard occasionally.

4.2.3 Location 3

Measurement location 3 was close to the eastern site boundary in front of a row of trees. This location was chosen to represent the proposed residences furthest from Newbury Road.

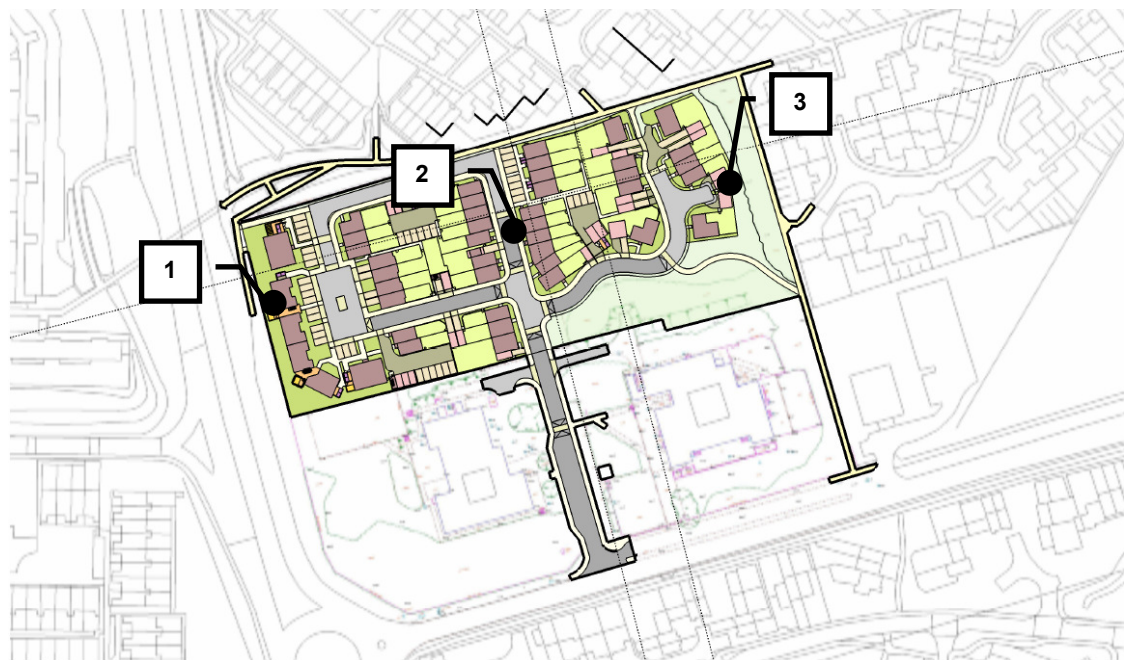


Figure 2: Measurement locations (currently open site – proposed development shown)

5 Results

Full details of the measured levels are shown in Appendix A.

Location	Calculated Daytime L_{Aeq} (dB)	NEC Zone	Calculated Night-time L_{Aeq} (dB)	NEC Zone
1	69	C	45	B
2	50	A	45	B
3	45	A	43	A

Table 3 Calculated day and night-time L_{Aeq} levels at each of the three locations and associated Noise Exposure Categories

6 Assessment in Accordance with PPG24

Location 3 has been rated as NEC A. For NEC A PPG24 states: *'Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.'*

Location 2 has been rated as NEC A during the day but NEC B at night (therefore overall rating NEC B). For NEC B PPG24 states: *'Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.'*

It will therefore be necessary to apply some or all of the mitigation measures outlined in the following Section 8 to ensure a reasonable level of protection for the occupants of the dwellings.

Location 1 has been rated as NEC B at night but NEC C during the day (therefore overall rating NEC C). For NEC C PPG24 states: *'Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.'*

If planning permission is to be granted for the area of the site closest to Newbury Road then the mitigation measures outlined in Section 8 should be applied to provide a reduction in the noise exposure for residents.

7 Future Noise Levels

7.1 Traffic Increases

It is considered that the increases in traffic flow due to the additional parking facilities for the residents of the proposed residential development would have little effect on the traffic noise levels in the area. Hence, the NECs described above would be unchanged. Should the need arise for substantial changes to the surrounding road network leading to large increases in traffic flow to the immediate area, further assessment of the possible traffic noise levels should be conducted.

7.2 Plant Noise

Any new service plant associated with the development should be specified such that noise from it does not prejudice the noise climate at the proposed dwellings.

8 Possible Mitigation

8.1 Site Layout

The west side of the development closest to the major traffic noise source will screen the east side of the development to some extent. Hence the noise levels at Locations 2 and 3 to the west side would be lower than those measured. The row of residences closest to Newbury Road is therefore likely to be the one where significant noise mitigation measures would be required if planning permission is to be considered.

8.2 Screening

To be effective, a screen would need to break the line of sight between the source and receiver. Noise screening could be included along the boundary with Newbury Road to limit the road traffic noise exposure of the nearest residences. A 2m fence is only likely to provide a significant benefit to the ground floor.

8.3 Building Orientation

Locating the most noise sensitive rooms within the dwellings on the east side of the building will significantly reduce their noise exposure due to screening from the buildings themselves. Where possible, less noise sensitive rooms such as bathrooms, kitchens etc should face Newbury Road.

8.4 Building Design

BS 8233:1999 'Sound insulation and noise reduction for buildings' [3] contains recommended internal noise levels for bedrooms ($L_{Aeq T} = 30$ to 35dB) and living areas ($L_{Aeq T} = 30$ to 40dB).

The detailed acoustic design of the building envelope should be such that the internal noise criteria described in BS 8233 is met. The internal noise levels suggested above could be achieved with the use of a good standard of acoustic double glazing. For example for the 'at risk' façades, closed standard thermal glazed windows with a specification of 10/12/6mm, fitted with good seals would offer approximately 35dB attenuation of the noise from the outside to the inside.

9 Conclusion

An assessment of environmental noise has been carried out for the proposed development of residential properties at Shepherds Spring, Andover.

A background noise survey was carried out at various times of the day and night to establish ambient noise conditions at the site proposed for redevelopment. It was found that the main noise source was road traffic on Newbury Road (A343).

Comparisons of measured noise levels have been made with the guidance contained in the relevant Planning Policy Guidance Note 24 (PPG24).

The measured noise levels show that the proposed residential areas at the west end of the development should be rated as NEC C. Those towards the centre of the development should be rated as NEC B and those at the east end of the development should be rated as NEC A.

The layout of the proposed development itself will provide effective screening to all but those residences closest to Newbury Road and will act to reduce noise level across the site. Hence the noise levels at Locations 2 and 3 to the west side would be lower than those measured.

It will be necessary to incorporate suitable noise mitigation into residences closest to the Newbury Road boundary for this development to proceed. These would need to ensure that a commensurate level of protection against noise is provided for the dwellings to achieve an appropriate internal noise climate according to the relevant standards.

New noise sources resulting from the addition or modification of service plant due to the development should be specified such that noise from it does not prejudice the noise climate at the proposed buildings.

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REFERENCES

- [1] Planning Policy Guidance Note 24
- [2] Department of Transport (1988), Calculation of Road Traffic Noise, HMSO
- [3] British Standards Institution (1999) BS 8233 British Standard code of practice for sound insulation and noise reduction for buildings, British Standards Institution.

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Appendix A

**Full Noise Survey
Results**

A1 Full Noise Survey Results

A1.1 Daytime Measurements 6 August 2008

Date	Location	Time		Wind		Noise Level, dB (A)				Comments
		Start	Finish	Speed (ms ⁻¹)	Direction	L ₉₀	L ₁₀	L _{max}	L _{eq}	
06/08/08	1	10:00	10:15	<2	SW	50.2	73.4	84.9	68.2	Road noise dominates. Generally quiet otherwise. Occasional lorry on road. Some distant construction noise from far side of A343 – very faint and intermittent. Occasional pedestrians using footbridge.
06/08/08	3	10:18	10:33	<2	SW	44.2	49.4	65.7	48.4	Very quiet. Road noise from A343 dominates ~100m. Distant road traffic noise also audible. Distant aircraft and train noise just audible in quiet periods.
06/08/08	2	10:36	10:51	<3	SW	47.0	52.8	65.5	50.8	Distant road traffic noise in addition to that from A343 ~50m. Train. Pedestrians walking along path at site boundary.
06/08/08	1	11:00	11:15	<2	SW	49.2	72.6	87.6	67.8	Distant siren. Road noise dominates. Bus pulled into lay-by / bus stop for ~5 seconds.
06/08/08	3	11:19	11:34	<2	SW	43.6	48.4	57.6	46.9	Road traffic noise dominates – both local and distant. Local pedestrians and cyclists. Distant train.
06/08/08	2	11:36	11:51	<2	SW	45.8	52.4	63.3	52.0	Road traffic noise dominates. Train.
06/08/08	1	12:00	12:15	<1	SW	48.6	72.6	81.2	67.8	Dominated by road traffic noise.
06/08/08	3	12:18	12:33	<1	SW	42.2	48.0	63.9	46.7	Still dominated by road traffic noise. Train, distant helicopter.
06/08/08	2	12:36	12:51	<1	SW	45.0	50.8	60.4	48.8	Traffic noise dominant.

A1.2 Evening / Night-time Measurements 19-20 August 2008

Date	Location	Time		Wind		Noise Level, dB (A)				Comments
		Start	Finish	Speed (ms ⁻¹)	Direction	L ₉₀	L ₁₀	L _{max}	L _{eq}	
19/08/08	1	17:04	17:19	1	SW	48.6	54.8	62.0	52.6	Road traffic noise dominates. Some digging in garden of nearby house. Some pedestrian activity.
19/08/08	2	17:22	17:37	2	SW	47.2	55.4	68.3	53.2	Road traffic noise dominates. Some distant rail noise. Some pedestrian activity. Police siren.
19/08/08	3	17:44	17:59	1	SW	46.4	52.4	61.2	50.1	Distant road traffic noise. Pedestrian activity. Distant low flying helicopter.
19/08/08	1	19:51	20:06	2-3	SW	43.6	54.2	70.4	50.9	Road traffic noise dominates. Less traffic than previously.
19/08/08	2	20:12	20:27	2	SW	42.6	51.6	65.5	49.3	Road traffic noise dominates. Motorcycle.
19/08/08	3	20:32	20:47	2	SW	43.6	49.4	62.4	47.4	Occasional rail noise. Distant road traffic.
19/08/08	1	20:53	21:08	1-2	SW	41.8	51.4	68.2	48.5	Road traffic noise dominates. Motorcycle.
19/08/08	2	21:15	21:30	2	SW	40.8	49.8	58.8	46.9	Road traffic dominates.
19/08/08	3	21:35	21:50	2	SW	39.4	46.4	55.8	44.0	Distant road traffic dominates.
19/08/08	1	21:56	22:11	1	SW	37.8	48.8	62.1	44.8	Less road traffic, but still dominant source however.
19/08/08	2	22:15	22:30	1	SW	38.0	48.0	56.7	44.8	Wildlife noise. Helicopter.
19/08/08	3	22:36	22:51	1	SW	38.4	46.0	55.9	43.3	Fire siren.
20/08/08	1	01:00	01:15	<1	-	28.2	37.8	62.0	37.5	Few cars, but traffic noise still dominates.
20/08/08	2	01:18	01:33	<1	-	29.0	36.0	53.9	34.2	-
20/08/08	3	01:37	01:52	<1	-	30.2	36.4	50.5	34.6	No pedestrian activity. Road traffic audible in distance.
20/08/08	1	02:00	02:15	<1	-	29.2	34.8	54.1	34.2	-
20/08/08	2	02:17	02:32	1-2	-	28.8	35.8	50.3	33.7	-
20/08/08	3	02:38	02:53	1-2	-	29.6	34.8	56.2	33.3	-

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Appendix B

**Environmental
Acoustic Terminology**

B1 dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An A-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. It is worth noting that an increase or decrease of approximately 10dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 3dB is the minimum perceptible change under normal conditions.

B2 Equivalent Continuous Sound Level

Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq} . This is a notional steady level which would, over a given period of time, to deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

B3 Statistical Noise Levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10} , the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L_{90} , the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_1 , the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10} , dBL_{A90} etc. The reference time period (T) is normally included, eg $dBL_{A10, 5 \text{ min}}$ or $dBL_{A90, 8 \text{ hr}}$.

B4 Maximum Noise Level

This is generally expressed as the maximum A-weighted noise level (L_{Amax}) and represents the maximum instantaneous noise level that occurred with the monitoring period. Certain assessment criteria recommend maximum noise levels to avoid disturbance as well as limits for longer-term averaged noise exposures.

B5 Sound Power Level

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level varies as a function of distance from a source. However, the sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.