



Noise Survey Ref BA NS226/3

Proposed Residential Development
Land at Jacques Way, Wrexham LL11 2BY

Prepared by :

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14.08.2019

On behalf of :

Castlemead Homes Ltd.

BA NS226/3 - Land at Jaques Way, Wrexham LL11 2BY

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1 Executive Summary

All road and rail noise fall within the Tan 11 Noise Exposure Category A.

. Adequate internal BS8233:2014 noise levels are achievable through the implementation of the glazing and ventilation specified within this report.

. Measured noise levels indicate that external amenity levels would be below 50dB through the introduction of standard garden fencing.

. The revised plans indicate that a low plant noise impact may be achieved by eliminating all living and bedroom windows along the north facade of plot 8.

2 Introduction

The proposed development is for the construction of a number of 2 and 3 bedroom properties, with a number of 1 and 2 bedroom flats at the Southern end of the site, with associated parking and amenity areas.

The area is subjected to constant noise from vehicle movement along the nearby A541 Mood Road, and the A483, and occasional rail movements on either side. The North East corner of the site is also subjected to noise from a bank of externally positioned condensers belonging to the adjacent Premier Inn.



Figure 1: Existing Site

Prior to undertaking the work, Blue Acoustics made contact with Paul Campini (Wrexham Council Environmental Officer), who stipulated that both road and railway noise be assessed according to TAN 11 guidance.

The site was attended on 4-5th September 2018, during which long term unattended, and short term attended noise measurements were taken to determine day and night time noise levels around the site with respect to vehicle, train and plant noise sources.

Train timetables were sourced for both passenger and freight train movements for the purpose of rail noise assessment, and a number of train movements witnessed and logged.

Separate road and rail noise assessments were then carried out for two discrete locations representing both the East and the West sides of the site.

Glazing and ventilation specifications have been calculated according to internal noise level guidance laid out in BS8233:2014.

A BS4142:2014 assessment was carried out to determine the potential noise impact of the Premier Inn plant.

3 Site Details

The site is situated near the centre of Wrexham, flanked by two railway lines identified as :

The Bidston to Wrexham Line : approximate 2 x 2 carriage passenger trains per hour, no freight. This line is at a reduced elevation to the site, down an embankment, approximate distance 6m from site boundary.

The Chester to Shrewsbury Line : mixture of 2 - 5 carriage passenger trains averaging approx. 3 per hour, with 3 freight movements during daytime hours. Level with site elevation, approximately distance 12m from site boundary.

The A451 runs NW / SE approximately 100m to the North East of the site, and the A483 dual runs N/E / SW approximately 700m to the West of the site.

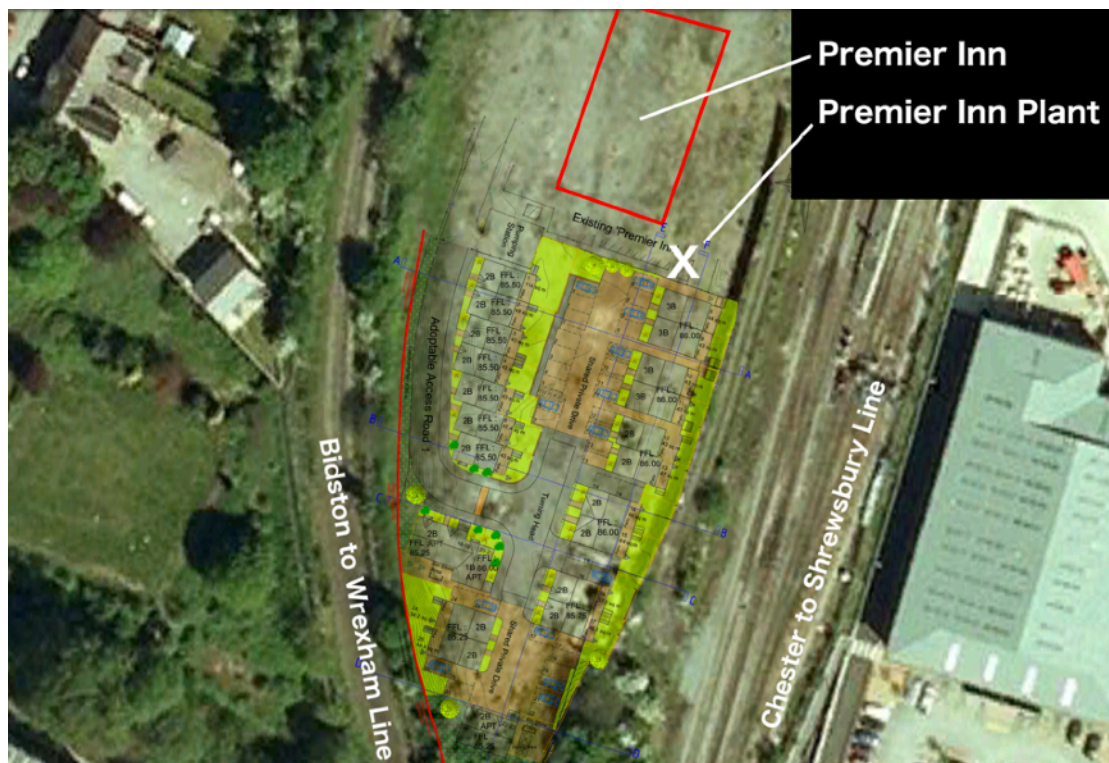


Figure 2 : Aerial view of site

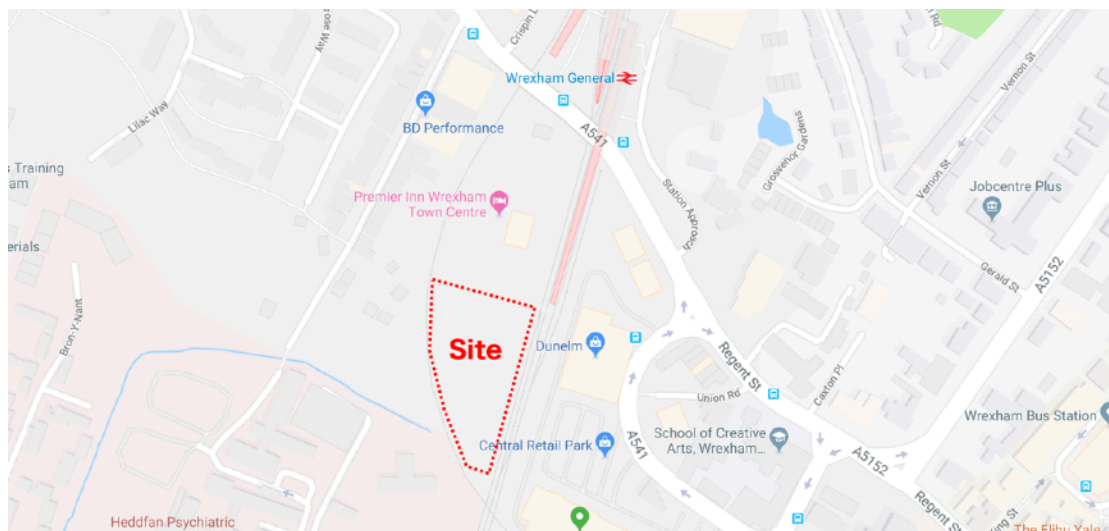


Figure 3 : Map of site in relation to local area

4 Measurement Details

4.1 Personnel and Equipment

All testing, calculation & evaluation was conducted by Timothy Sherlock-Brown M.I.O.A. of Blue Acoustics. Timothy is a Member of the Institute of Acoustics and possesses an MSc in Applied Acoustics

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Cirrus Research Optimus 171B Class 1 Integrated Averaging Sound Level Meter :

Serial Number	G068016
Calibration Date	02.01.2018
Calibration Certificate no.	255844

Cirrus Research CR 821A Class 1 Integrated Averaging Sound Level Meter :

Serial Number	b15061fe
Calibration Date	27.03.17
Calibration Certificate No.	111294

Cirrus Research CR 822B Class 2 Integrated Averaging Sound Level Meter :

Serial Number	C19443FB
Calibration Date	22.01.2018
Calibration Certificate No.	116410

Calibrated prior to measurement with the following Cirrus Research CR515 Acoustic Calibrator :

Serial Number	69304
Calibration Date	02.01.2018
Calibration Certificate no.	115967

Care was taken to eliminate external influence on the measurements by the application of a windshield, and wind speed monitoring. All measurements were taken at an angle of approx. 60 degrees at approx., and unless stated, 1.2m to 1.5m from the ground.

Calibration was performed before and after each measurement or set of measurements with no notable drift. A drift of up to 0.5dB is considered reasonable and is generally the cause of gradients in variables such as temperature, humidity and battery power.

4.2 Noise Climate

The noise climate differs around the site, and is at any point a combination of the following sources :

Source	Origin
Distant traffic noise from the A483	From the West
Traffic noise from Mold Road	From the North & East
Rail movements	Either Side
Aircraft movements	Above

Table 1 : Noise climate table

4.3 Weather Conditions

Dry with prolonged sunny periods

Temp 11c - 17c

Wind <4ms North Westerly

4.4 Topography

Concrete / road

4.5 Measurement Positions

The East side position (1) was approx. 7m from the East side boundary and the same distance from the North side boundary. This position was chosen to capture railway and A451 noise at the most North Easterly plot facade.

The West side position was chosen to measure noise levels at the plot facade nearest to the Bidston to Wrexham line, approximately 8m from the West side railway line.

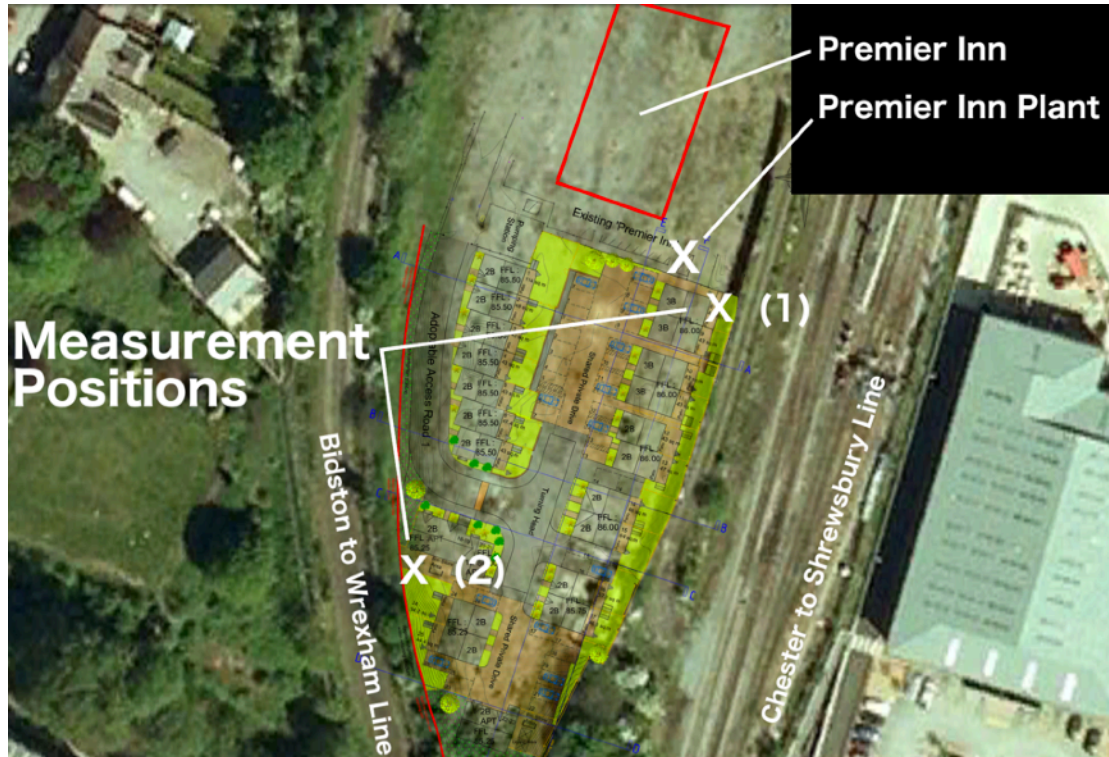


Figure 4 : Measurement Positions



Figures 5 & 6 : East & West side measurement positions (respectively)

5 Presentation of Measurement Results

L_{Aeq,16hr} values have been attained through the logarithmic averaging of the available daytime L_{Aeq} data for each location, as the CRTN short method was deemed inaccurate due to the distance from the road noise source.

Night time noise data for position 1 was found to be corrupted by the presence of Premier Inn plant noise. As such, the only fair assumption for this value is that it falls below the daytime L_{Aeq,16} value of 49.8dB.

Position	Measurement	Period	Value
1	L _{Aeq,16hr}	07:00 - 23:00	49.8 dB
	L _{Aeq,8hr}	23:00 - 07:00	<49.8 dB
	LAF _{Max} (night)	23:00 - 07:00	82.0 dB
2	L _{Aeq,16hr}	07:00 - 23:00	52.9 dB
	L _{Aeq,8hr}	23:00 - 07:00	46.2 dB
	LAF _{Max} (night)	23:00 - 07:00	69.0 dB

Table 2 : Long term noise data

Position	Time	Type	Direction	SEL
1	06:44	5 carriage passenger (slow)	South	76.4
1	06:46	2 carriage passenger (slow)	North	76.0
1	06:52	5 carriage passenger (slow)	North	78.7
1	09:56	2 carriage passenger (slow)	South	74.4
1	10:37	2 carriage passenger (slow)	South	74.2
1	10:59	2 carriage passenger (slow)	North	77.2
1	11:52	4 carriage passenger (slow)	South	80.1
1	12:06	2 carriage passenger (slow)	North	73.8
1	12:41	2 carriage passenger (slow)	South	74.1
Average SEL				76.1 dB

Table 3 : Position 1 passenger train SEL data

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Time	Type	Direction	SEL
21.06	Shotton Steel Train	South	85.7 dB

Table 4 : Position 1 freight train SEL data

Position	Time	Type	Direction	SEL
2	09:30	2 carriage passenger (slow)	South	82.1
2	09:34	2 carriage passenger (slow)	North	83.3
2	10:30	2 carriage passenger (slow)	South	82.0
2	10:34	2 carriage passenger (slow)	North	84.8
2	11:30	2 carriage passenger (slow)	South	82.7
2	11:34	2 carriage passenger (slow)	North	86.3
2	12:28	2 carriage passenger (slow)	South	82.5
2	12:32	2 carriage passenger (slow)	North	83.5
Average SEL				83.4 dB

Table 5 : Position 2 passenger train SEL data

6 Tan 11 Assessment

Tan 11 provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

Table 2: RECOMMENDED NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES

Noise Levels corresponding to the Noise Exposure Categories for New Dwellings LAeq,TdB				
Noise Source	Noise Exposure Category			
	A	B	C	D
Road Traffic 0700 - 2300	<55	55-63	63-72	>72
	<45	45-57	57-66	>66
Rail traffic 0700 - 2300	<55	55-66	66-74	>74
	<45	45-59	59-66	>66
Air Traffic 0700 - 2300	<57	57-66	66-72	>72
	<48	48-57	57-66	>66
Mixed Source 0700 - 2300	<55	55-63	63-72	>72
	<45	45-57	57-66	>66

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.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
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.
D	Planning permission should normally be refused.

6.1 Rail Noise

Rail noise is evaluated in terms of LAeq for both day and night time periods by the following equation :

$$LA_{eq}(T) = SEL_{average} + 10\log N - 10\log T$$

Where $SEL_{average}$ = Average 'Sound Exposure Level'

N = Number of train passes in time period T

T = Time period in seconds

The following approximate train pass statistics have been sourced from www.thetrainline.com and www.freightmaster.net for each line.

Location	Period	Passenger	Freight
1	Day	48	3
	Night	5	0
2	Day	48	0
	Night	2	0

Table 6 : Train movement data

Location	Period	LAeq	Tan 11 NEC
1	LAeq,16hr (Day)	47.3 dB	A
	LAeq,8hr (Night)	38.5 dB	A
2	LAeq,16hr (Day)	52.6 dB	A
	LAeq,8hr (Night)	41.8 dB	A

Table 7 : Rail noise Tan 11 table

All rail noise falls within the Tan 11 Noise Exposure Category A which 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 desirable.”

6.2 Road Noise

The following road noise levels were established by the subtraction of rail noise from the measured ambient noise levels.

Position	Measurement	LAeq	Tan 11 NEC
1	LAeq,16hr (Day)	46.2 dB	A
1	LAeq,8hr (Night)	<46.2 dB	A
2	LAeq,16hr (Day)	47.0 dB	A
2	LAeq,8hr (Night)	44.2 dB	A

Table 8 : Road noise Tan 11 table

All road noise falls within the Tan 11 Noise Exposure Category A which 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 desirable.”

It should be understood that whilst position 1 LAeq is < 46.2 dB, it is expected to fall below 45dB and therefore reside within the A category.

7 BS8233:2014 Assessment

WHO 1999 Guidelines to Community Noise states: “For a good sleep, it is believed that indoor sound pressure levels should not exceed **approximately 45 dB LAFmax more than 10-15 times per night**”

For location 1, the highest night time LAFMax of 82.0 dB at 23:27 was a relatively isolated incident. As such, 70dB has been adopted to represent the LAFMax for BS8233:2014 assessment, exceeded on four occasions through the night.

Location 1	Value	BS8233:2014 & WHO Inside Bedroom	Bedroom Glazing Rw + Ctr	Living Room Glazing (35dB Day resting)
LAeq,16hrs (Day)	50 dB	35 dB		15 dB
LAeq,8hrs (Night)	<50dB	30 dB	<20 dB	
LAFMax (Evening & Night)	70 dB	45 dB	25 dB	

Table 9 : BS8233:2014 assessment table for location 1

For location 2, the highest night time LAFMax of 73.6 dB at 06:30 was a relatively isolated incident. As such, 67dB has been adopted to represent the LAFMax for BS8233:2014 assessment, exceeded on two occasions through the night.

Location 2	Value	BS8233:2014 & WHO Inside Bedroom	Bedroom Glazing Rw + Ctr	Living Room Glazing (35dB Day resting)
L _{Aeq} ,16hrs (Day)	53 dB	35 dB		18 dB
L _{Aeq} ,8hrs (Night)	47 dB	30 dB	17 dB	
L _{AF} Max (Evening & Night)	67 dB	45 dB	22 dB	

Table 10 : BS8233:2014 assessment table for location 2

BS8233:2014 states that “If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the facade insulation or the resulting noise level”

BS8233:2014 calculations indicate that adequate insulation for both bedrooms and living rooms may be achieved through the use of standard 4/6-16/4 double glazing, which, in its generic form, provides $R_w + C_{tr} = 25$ dB of insulation according to EN12758.

Room Type	Minimum Glazing $R_w + C_{tr}$	Facade Ventilation (Open) $D_{n,e,w} + C_{tr}$
Living	18dB	24dB
Bedroom	25dB	31dB

Table 11 : Recommended glazing and ventilation specification

L_{Aeq},16 levels indicate that external amenity levels would be below 50dB through the introduction of standard garden fencing.

8 BS4142:2014 Plant Noise Assessment

External plant belonging to Premier Inn was assessed by BS4142:2014 methodology. The plant is situated near the North East corner, along the boundary. The plant consists of a bank of 7 large condenser units, cited by the duty manager to be the hotel's air conditioning system.

The plant emits a low frequency hum, with higher frequency fan noise and audible clicking sounds.

On attendance a maximum of two units were ever in simultaneous operation, reflecting the low system use relative to the time of year / ambient temperature etc.

The chosen assessment position was the facade of the nearest plot as detailed on the site plans, at a distance of approximately 7m.

Although plant noise was audible at the assessment position, high residual noise levels made in-situ measurement difficult. As such, a measurement was taken of one condenser unit running at 1.0m (= 52.0 dB).



Figures 7 - 10 : Premier Inn plant

No. Of Condenser Units	Lp @ 1m	Distance Correction 20 log(1m / 7m)	Specific Noise LpA
1	52 dB	-17 dB	35 dB
3	57 dB	-17 dB	40 dB
5	59 dB	-17 dB	42 dB

Table 12 : Specific noise calculation table (Premier Inn Plant)

To assess the potential for noise impact, a scenario of 3 units running simultaneously was used to reflect general summertime operation. The following tonal correction was calculated assuming clearly audible tonality, low level impulsive content from the clicks and clearly identifiable on / off states.

Tonality	Impulsivity	Intermittency	Total
2	3	3	8

Table 13 : Tonal correction table (BS4142:2014 subjective method)

Plot	Period	Specific Noise Level	Tonal Correction	Rating Level	LA90	Assessment Level
8	Day	40 dB	+8 dB	48 dB	45 dB	+3 dB
	Night	40 dB	+8 dB	48 dB	40 dB	+8 dB

Table 14 : BS4142:2014 assessment table (3 units running)

When considering the assessment levels it should be understood that plot 8 is positioned side on and relatively centred to the plant. As such, there would be no line of sight propagation to the front & rear facades. It is therefore recommended that no living space windows be situated along the northern facade of plot 8.



9 Conclusions

The noise climate is a combination of distant road and local rail noise.

All road and rail noise fall within the Tan 11 Noise Exposure Category A.

Adequate internal BS8233:2014 noise levels are achievable through the implementation of the glazing and ventilation specified within this report.

Assessment level for the Premier Inn plant is an indication of an adverse impact at the nearest plot 8 facade depending upon the context. To put this into context, the noise should be all but inaudible at the front and rear facades and within the external amenity areas.

The northern facade of plot 8 should therefore possess no bedroom or living room windows.

Measured noise levels indicate that external amenity levels throughout the development would be below 50dB through the introduction of standard garden fencing.

10 Disclaimer

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

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Appendix 1 – Glossary of Terms

Ambient Noise: Totally encompassing sound in a given situation at a given time usually composed of sounds from many sources near and far. [BS 4142]

Attenuation: A reduction in the intensity of a sound signal.

Background Noise Level : The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval T, measured using the time weighting F, and quoted to the nearest number of whole decibels.

Decibel (dB): a unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 Pa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

dB(A): decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

Free Field: 1. A free sound field is a field in a homogeneous, isotropic medium free from boundaries. In practice it is a field in which the effects of the boundaries are negligible over the region of interest. The actual pressure impinging on an object (e.g., a microphone) placed in an otherwise free sound field will differ from the pressure which would exist at the point with the object removed, unless the acoustic impedance of the object matches the acoustic impedance of the medium.

2. An environment in which there are no reflective surfaces within the frequency region of interest. 3. A region in which no significant reflections of sound occur.

4. [BS4142] suggests that free-field environmental noise measurements need to be made at least 3.5m from any reflecting structure.

Hertz (Hz): unit of frequency, equal to one cycle per second. Frequency is related to the pitch of a sound.

LA90,T : the A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142:

1997 it is used to define background noise level.

LAeq,T : the equivalent continuous sound level -the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). LAeq,T is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is written as Leq in connection with aircraft noise.

LAmaz: the highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated.

Rating Level : The specific noise level plus any adjustment for the characteristic features of the noise.

Residual Noise : The ambient noise remaining at a given position in a given situation when the specific noise level is suppressed to a degree such that it does not contribute to the ambient noise.

Specific noise source : The noise source under investigation for assessing the likelihood of complaints.

Steady Noise: Noise that gives fluctuations over a range of not more than 5 dB on a sound level meter set to frequency weighting A and time weighting S. [BS 4142:2014]

Appendix 3 Guidance & Reference

Tan 11 provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

Table 2: RECOMMENDED NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS NEAR EXISTING NOISE SOURCES

Noise Levels corresponding to the Noise Exposure Categories for New Dwellings LAeq,TdB					
Noise Source		Noise Exposure Category			
		A	B	C	D
Road Traffic	0700 - 2300	<55	55-63	63-72	>72
	2300 - 0700	<45	45-57	57-66	>66
Rail traffic	0700 - 2300	<55	55-66	66-74	>74
	2300 - 0700	<45	45-59	59-66	>66
Air Traffic	0700 - 2300	<57	57-66	66-72	>72
	2300 - 0700	<48	48-57	57-66	>66
Mixed Source	0700 - 2300	<55	55-63	63-72	>72
	2300 - 0700	<45	45-57	57-66	>66

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.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
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.
D	Planning permission should normally be refused.

BS 8233:2014 advises that in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the following guideline values :

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB LAeq, 16hour	-
Dining	Dining Room	40 dB LAeq, 16hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16hour	30 dB LAeq, 8hour
Maximum levels outside bedrooms	LAFMax of 60 dB	50 dB LAeq, 16hour	45 dB LAeq, 8hour

WHO guidelines state that "based on limited data available, a level of less than 35 dB(A) is recommended to preserve the restorative process of sleep" and advises an internal LA,max of 45 dB

WHO guidelines 1999 similarly state that external amenity areas should not be subjected to daytime averaged noise levels of greater than **55dB LAeq**, and ideally **50dB**.

BS 4142:2014 “Method for rating industrial noise affecting mixed residential and industrial areas”. The standard provides guidance on the measurement and assessment industrial noise with respect to it’s impact on sensitive residential developments.

The method involves the measurement of the **ambient noise level** and the **residual and background noise levels**.

A pre-determined method is then carried out to ascertain the ‘**specific**’ **industrial noise level**.

This is then adjusted to reflect tonal characteristics to give a **rating level**.

The **background noise level** is then subtracted from **the rating level** to give an **assessment level** to determine the likelihood of complaints using the following table :

Result of subtraction of the Measured Background LAF90 from the BS4142 Rating Level, LAr,Tr	BS4142:2014 noise assessment
+ 10 dB or more	Likely to be an indication of a significant adverse impact, depending on the context
Around + 5 dB	Likely to be an indication of an adverse impact, depending on the context
Below + 5 dB	The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context

Table 1 : BS4142:2014 assessment table

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Appendix 4 Measurement Data Sheets

Environmental Noise Measurement Report

Measurement Details

Location: Land by Jaques Way, Wrexham
Description: East side long term measurement
Date of Measurement: 05-09-18 01:21

Instrumentation Details

Sound Level Meter: Cirrus Research plc CR:800 B15061FE
Acoustic Calibrator: Cirrus Research plc CR:511E
Calibration: -0.3dB Drift
Recalibration Due: 31-03-19
Level Range: 20-80 dB
Time Weighting: Fast (for Lmax and Lns)

Measurement Data

Start of Measurements: 04-09-18 16:03
No. of Measurements: 59
Total Duration: 14:11:01
Highest Lmax: 82.0
Lmax Exceedance Count: 0 at or above 115dB

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	Peak dBC	L1	L10	L50	L90	L95	L99
04-09-18	16:03:01	00:14:59	55.2	78.1	92.9	68.5	49.8	46.4	45.0	44.6	43.7
04-09-18	16:18:07	00:14:59	53.1	72.4	91.4	67.3	48.8	46.4	45.2	44.8	44.0
04-09-18	16:33:12	00:14:59	51.6	72.6	90.1	61.6	53.8	47.2	45.5	45.2	44.7
04-09-18	16:48:18	00:01:47	56.9	77.7	92.2	63.8	57.8	50.8	48.3	47.9	47.4
04-09-18	21:05:26	00:14:59	57.8	78.5	93.9	69.7	59.3	51.3	48.6	48.1	46.7
04-09-18	21:20:32	00:14:59	51.0	59.4	80.4	54.9	53.0	50.5	48.1	47.6	46.6
04-09-18	21:35:37	00:14:59	53.4	72.1	90.2	61.3	53.0	50.9	49.3	48.8	48.1
04-09-18	21:50:42	00:14:59	51.1	62.1	83.8	56.5	52.4	50.4	48.9	48.4	47.7
04-09-18	22:05:48	00:14:59	50.6	70.8	90.8	54.1	51.2	49.2	47.3	46.7	45.6
04-09-18	22:20:53	00:14:59	49.4	56.5	79.0	53.8	51.3	48.7	46.5	46.0	44.7
04-09-18	22:35:59	00:14:59	51.1	70.2	90.5	60.5	50.9	47.8	45.3	44.6	43.7
04-09-18	22:51:04	00:14:59	51.8	72.9	90.9	62.4	51.5	47.7	45.5	45.0	44.0
04-09-18	23:06:09	00:14:59	47.9	55.5	79.2	52.8	50.0	47.2	44.7	44.0	42.6
04-09-18	23:21:15	00:14:59	61.7	82.0	92.3	76.2	51.0	47.5	45.1	44.4	43.5
04-09-18	23:36:20	00:14:59	48.5	64.4	89.2	59.3	49.6	46.0	43.6	42.9	41.8
04-09-18	23:51:25	00:14:59	48.7	68.0	89.3	60.7	48.3	45.0	42.7	42.2	41.5
05-09-18	00:06:31	00:14:59	48.8	69.1	91.1	56.2	48.9	45.7	42.6	41.7	40.3
05-09-18	00:21:36	00:14:59	47.2	55.4	78.1	53.4	49.5	45.9	42.6	42.1	41.4
05-09-18	00:36:41	00:14:59	45.8	55.9	74.8	51.4	48.1	44.8	41.2	40.4	39.2
05-09-18	00:51:47	00:14:59	44.2	56.9	74.1	49.8	46.4	43.1	40.0	39.6	38.8
05-09-18	01:06:52	00:14:59	47.0	55.5	78.2	53.9	49.9	45.3	40.7	39.5	38.6
05-09-18	01:21:57	00:14:59	44.3	56.0	73.8	49.9	47.4	42.8	39.9	39.3	38.5
05-09-18	01:37:03	00:14:59	43.9	62.8	79.3	49.1	46.3	42.6	40.0	39.6	38.5
05-09-18	01:52:08	00:14:59	44.3	55.5	76.9	49.4	46.9	43.1	40.5	40.1	39.5

BA NS226/3 - Land at Jaques Way, Wrexham LL11 2BY

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Environmental Noise Measurement Report

Date	Time	Run Duration	Leq dB	Lmax dB	Peak dBC	L1	L10	L50	L90	L95	L99
		(hh:mm:ss)									
05-09-18	02:07:14	00:14:59	46.5	67.1	83.3	57.3	46.8	42.5	40.4	39.9	39.3
05-09-18	02:22:19	00:14:59	44.2	56.2	74.1	50.9	46.7	42.8	40.0	39.6	38.9
05-09-18	02:37:24	00:14:59	44.0	52.0	75.3	49.2	46.5	42.8	40.0	39.4	38.4
05-09-18	02:52:30	00:14:59	43.9	57.0	75.7	49.4	46.5	42.6	39.4	38.6	37.5
05-09-18	03:07:35	00:14:59	44.7	55.2	76.0	50.8	47.1	43.5	40.3	39.8	39.2
05-09-18	03:22:40	00:14:59	46.1	54.8	79.7	51.8	48.6	45.1	41.0	40.4	39.5
05-09-18	03:37:46	00:14:59	45.4	54.8	75.0	50.3	47.7	44.6	41.1	39.9	38.6
05-09-18	03:52:51	00:14:59	44.9	52.3	76.2	49.5	47.1	44.1	41.5	40.9	39.6
05-09-18	04:07:56	00:14:59	46.6	54.5	79.8	53.2	48.7	45.3	42.6	42.0	41.1
05-09-18	04:23:02	00:14:59	47.5	55.4	77.7	52.8	50.1	46.4	43.3	42.7	41.7
05-09-18	04:38:07	00:14:59	47.5	55.5	80.0	52.1	49.5	47.0	43.0	41.9	40.7
05-09-18	04:53:12	00:14:59	48.5	59.4	79.5	53.9	50.7	47.8	44.3	43.0	39.6
05-09-18	05:08:18	00:14:59	49.2	57.4	77.8	53.3	51.3	48.5	45.8	44.9	43.8
05-09-18	05:23:23	00:14:59	49.7	59.6	84.7	54.2	51.6	49.0	45.9	45.2	44.2
05-09-18	05:38:29	00:14:59	54.7	75.3	89.9	63.9	54.6	51.3	48.8	48.3	47.6
05-09-18	05:53:34	00:14:59	56.5	71.6	91.5	66.4	57.7	55.5	50.0	49.3	48.3
05-09-18	06:08:40	00:14:59	53.1	59.6	81.6	56.2	54.5	52.7	51.2	50.8	49.8
05-09-18	06:23:45	00:14:59	53.9	69.4	90.6	60.9	54.4	52.6	51.1	50.7	49.5
05-09-18	06:38:51	00:14:59	56.1	70.9	91.2	66.8	55.9	53.8	52.3	51.9	51.1
05-09-18	06:53:56	00:06:49	55.0	76.6	90.1	59.5	55.8	54.2	52.7	52.3	51.7
05-09-18	09:30:07	00:14:59	51.5	77.2	91.8	62.7	50.5	47.0	44.7	44.1	43.0
05-09-18	09:45:12	00:14:59	49.1	67.6	89.5	57.2	49.6	46.6	44.0	43.2	41.8
05-09-18	10:00:17	00:14:59	48.6	68.2	90.8	56.4	48.1	45.8	43.6	42.6	41.1
05-09-18	10:15:23	00:14:59	46.8	65.4	83.0	51.5	48.5	46.1	43.2	42.5	41.4
05-09-18	10:30:28	00:14:59	49.3	66.8	89.0	57.6	49.7	46.6	44.2	43.5	41.6
05-09-18	10:45:34	00:14:59	50.5	71.9	90.6	57.3	49.4	46.5	43.3	42.7	41.7
05-09-18	11:00:39	00:14:59	49.1	67.3	84.2	51.9	49.9	48.6	47.3	46.9	46.1
05-09-18	11:15:44	00:14:59	48.5	56.3	82.5	51.8	50.0	48.0	46.5	46.1	45.3
05-09-18	11:30:50	00:14:59	49.4	64.8	81.9	54.7	51.0	48.4	46.9	46.5	45.9
05-09-18	11:45:55	00:14:59	52.4	72.9	89.5	64.6	50.1	47.1	45.0	44.5	43.6
05-09-18	12:01:00	00:14:59	50.3	68.9	91.1	57.9	51.5	48.0	45.5	44.9	43.8
05-09-18	12:16:06	00:14:59	48.8	55.6	81.5	53.2	50.4	48.2	46.5	46.0	45.4
05-09-18	12:31:11	00:14:59	50.0	65.9	89.3	58.2	50.8	48.3	46.2	45.8	45.3
05-09-18	12:46:16	00:14:59	50.5	68.6	89.9	59.3	50.4	48.4	46.7	46.3	45.6
05-09-18	13:01:22	00:03:21	49.9	65.9	85.4	57.0	50.2	48.6	47.0	46.6	46.1

BA NS226/3 - Land at Jaques Way, Wrexham LL11 2BY

Environmental Noise Measurement Report

Measurement Details

Location: Land off Jaques Way, Wrexham
Description: West side measurement
Date of Measurement: 05-09-18 08:45

Instrumentation Details

Sound Level Meter: Cirrus Research plc CR:800B C19443FB
Acoustic Calibrator: Cirrus Research plc CR:511E
Calibration: 0.0dB drift
Recalibration Due: 31-01-19
Level Range: 30-100 dB
Time Weighting: Fast (for Lmax and Lns)

Measurement Data

Start of Measurements: 04-09-18 16:56
No. of Measurements: 82
Total Duration: 20:05:39
Highest Lmax: 88.9
Lmax Exceedance Count: 0 at or above 115dB

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	Peak dB	L1	L10	L50	L90	L95	Lmin
04-09-18	16:56:56	00:03:03	60.9	84.9	107.4	69.6	63.7	54.2	45.7	42.4	37.3
04-09-18	17:00:00	00:14:59	56.4	78.9	106.3	69.4	56.3	47.3	45.9	45.5	43.7
04-09-18	17:15:00	00:15:01	48.2	58.1	90.6	54.8	50.8	47.1	45.7	45.4	43.8
04-09-18	17:30:00	00:14:59	57.6	78.9	100.1	73.1	52.1	49.0	46.4	45.8	44.0
04-09-18	17:45:00	00:15:00	47.5	59.3	82.8	55.2	49.4	46.5	44.8	44.5	43.1
04-09-18	18:00:00	00:14:59	46.4	56.9	84.5	50.6	48.3	46.0	43.9	43.6	41.7
04-09-18	18:15:00	00:14:59	45.5	57.5	82.3	48.9	46.9	45.2	43.7	43.3	41.8
04-09-18	18:30:00	00:14:59	54.2	79.0	102.2	62.6	50.1	46.3	44.5	44.0	41.4
04-09-18	18:45:00	00:15:01	55.1	78.1	98.9	65.4	51.7	47.3	46.0	45.8	44.6
04-09-18	19:00:00	00:14:59	48.0	62.1	86.6	54.9	50.1	46.8	45.7	45.4	43.8
04-09-18	19:15:00	00:15:02	47.8	61.4	81.3	51.7	49.4	47.4	45.9	45.5	44.1
04-09-18	19:30:00	00:15:00	55.4	77.3	98.3	65.5	55.0	50.3	47.7	47.1	45.1
04-09-18	19:45:00	00:15:00	57.1	82.8	101.3	67.4	55.5	49.9	46.7	46.1	43.6
04-09-18	20:00:00	00:15:01	50.6	63.0	84.0	58.6	53.2	49.0	47.1	46.6	44.3
04-09-18	20:15:00	00:15:01	49.8	63.1	82.2	58.1	51.7	48.0	46.1	45.7	43.7
04-09-18	20:30:00	00:14:59	48.5	65.5	88.2	55.1	49.9	47.5	46.0	45.7	44.2
04-09-18	20:45:00	00:15:00	49.9	59.3	83.1	56.4	52.7	48.3	45.9	45.4	43.4
04-09-18	21:00:00	00:14:59	52.0	68.5	88.6	58.6	55.2	50.1	47.0	46.5	44.1
04-09-18	21:15:00	00:15:01	48.9	61.1	84.0	56.7	51.1	47.3	45.1	44.6	42.1
04-09-18	21:30:00	00:15:00	51.0	64.6	83.3	58.4	53.6	49.4	47.1	46.7	44.2
04-09-18	21:45:00	00:14:59	58.0	78.7	103.5	72.7	51.3	48.7	47.5	47.1	45.2
04-09-18	22:00:00	00:15:00	47.6	57.5	84.7	52.6	49.5	47.1	44.6	44.1	41.8
04-09-18	22:15:00	00:15:00	45.3	55.5	77.3	48.2	46.5	45.0	43.3	42.9	41.1
04-09-18	22:30:00	00:14:59	45.4	53.4	77.3	48.9	47.0	44.9	42.9	42.4	39.6

BA NS226/3 - Land at Jaques Way, Wrexham LL11 2BY

Environmental Noise Measurement Report

Date	Time	Run Duration	Leq dB	Lmax dB	Peak dB	L1	L10	L50	L90	L95	Lmin
		(hh:mm:ss)									
04-09-18	22:45:00	00:14:59	48.5	73.0	92.0	56.2	48.7	45.0	42.6	42.0	39.9
04-09-18	23:00:00	00:14:59	44.4	50.4	75.1	47.7	46.0	43.8	41.9	41.5	40.1
04-09-18	23:15:00	00:14:59	51.9	69.0	95.0	66.8	47.1	42.9	40.6	40.0	37.8
04-09-18	23:30:00	00:14:59	42.3	52.6	76.8	46.8	44.5	41.0	39.1	38.7	36.8
04-09-18	23:45:00	00:15:00	43.5	53.0	81.5	50.8	45.5	42.0	39.5	38.8	36.6
05-09-18	00:00:00	00:14:59	43.7	55.7	87.1	51.3	45.8	42.0	39.2	38.7	36.4
05-09-18	00:15:00	00:14:59	42.0	49.6	85.6	46.9	44.1	40.9	38.3	37.5	35.5
05-09-18	00:30:00	00:15:01	42.1	52.2	71.4	46.9	44.2	41.0	38.6	38.1	35.9
05-09-18	00:45:00	00:14:59	41.1	50.3	74.5	45.5	42.9	40.1	37.5	36.8	34.3
05-09-18	01:00:00	00:14:59	39.7	47.1	73.8	44.2	41.6	38.4	35.8	35.1	31.6
05-09-18	01:15:00	00:15:00	40.9	48.1	74.5	45.3	43.0	39.8	36.4	35.5	32.8
05-09-18	01:30:00	00:14:59	38.8	50.4	72.4	43.5	40.5	37.5	34.6	33.9	30.9
05-09-18	01:45:00	00:15:00	40.3	50.9	71.1	45.0	42.2	39.0	36.1	35.3	32.3
05-09-18	02:00:00	00:14:59	41.6	61.1	79.3	51.5	43.0	38.5	35.4	34.5	31.5
05-09-18	02:15:00	00:15:00	39.9	49.4	74.9	44.8	41.5	38.6	35.9	35.2	32.9
05-09-18	02:30:00	00:15:00	40.0	51.0	73.0	45.1	42.0	38.6	34.9	33.9	31.6
05-09-18	02:45:00	00:14:59	40.0	51.2	71.3	45.0	42.3	38.2	34.7	33.7	31.9
05-09-18	03:00:00	00:14:59	39.6	48.7	72.3	45.4	41.6	37.9	34.9	34.2	31.8
05-09-18	03:15:00	00:14:59	41.8	52.0	75.0	48.4	43.3	40.4	37.9	37.4	35.1
05-09-18	03:30:00	00:15:00	39.1	49.1	75.1	44.4	41.0	37.6	34.6	34.0	31.9
05-09-18	03:45:00	00:15:00	39.3	46.9	73.7	43.6	40.6	38.2	35.8	34.9	32.0
05-09-18	04:00:00	00:15:01	40.0	49.8	73.4	44.4	41.5	38.8	36.5	35.8	32.7
05-09-18	04:15:00	00:15:00	41.0	49.1	77.7	46.1	42.7	39.8	37.0	36.4	33.9
05-09-18	04:30:00	00:15:00	41.6	50.1	76.4	46.2	42.9	40.6	38.8	38.3	36.0
05-09-18	04:45:00	00:15:00	42.4	50.3	79.8	47.2	44.0	41.4	39.2	38.6	36.3
05-09-18	05:00:00	00:14:59	44.9	57.0	80.2	50.0	46.5	43.8	42.1	41.7	40.3
05-09-18	05:15:00	00:14:59	44.0	51.1	79.7	47.6	45.5	43.4	41.7	41.3	39.4
05-09-18	05:30:00	00:15:00	47.1	59.3	84.2	53.6	48.5	46.3	44.8	44.4	42.4
05-09-18	05:45:00	00:15:00	52.8	65.8	89.2	59.5	55.5	51.5	47.6	47.1	45.1
05-09-18	06:00:00	00:14:59	54.0	63.0	84.0	59.3	55.9	54.2	48.5	47.8	45.6
05-09-18	06:15:00	00:15:00	49.0	58.5	82.8	52.7	50.3	48.5	47.2	46.9	45.4
05-09-18	06:30:00	00:15:00	51.5	73.6	87.7	60.6	52.0	49.1	47.9	47.7	46.5
05-09-18	06:45:00	00:14:59	50.0	66.6	90.3	55.7	51.2	49.2	48.0	47.8	46.5
05-09-18	07:00:00	00:14:59	55.7	79.4	103.0	65.6	51.8	49.8	48.4	48.1	46.7
05-09-18	07:15:00	00:15:01	55.5	79.6	102.5	63.0	51.7	50.1	48.9	48.6	47.1
05-09-18	07:30:00	00:14:59	52.4	67.4	92.7	62.6	53.1	50.7	49.2	49.0	47.7
05-09-18	07:45:00	00:14:59	50.3	64.5	88.7	57.2	51.6	49.3	47.9	47.6	46.3
05-09-18	08:00:00	00:15:00	50.0	71.2	90.4	59.0	51.5	48.1	46.7	46.4	45.2
05-09-18	08:15:00	00:15:00	54.2	77.0	99.0	64.3	51.2	48.1	46.2	45.8	44.5
05-09-18	08:30:00	00:15:01	53.9	75.8	102.0	65.9	50.5	47.1	45.7	45.3	43.9
05-09-18	08:45:00	00:15:00	47.0	61.9	82.3	53.2	48.3	46.3	44.8	44.3	42.5
05-09-18	09:00:00	00:14:59	49.8	64.8	89.8	58.6	51.2	48.4	46.8	46.3	44.6
05-09-18	09:15:00	00:15:01	50.0	75.9	96.6	59.1	49.9	46.5	44.7	44.2	42.5

BA NS226/3 - Land at Jaques Way, Wrexham LL11 2BY

Environmental Noise Measurement Report

Date	Time	Run Duration (hh:mm:ss)	Leq dB	Lmax dB	Peak dBC	L1	L10	L50	L90	L95	Lmin
05-09-18	09:30:00	00:15:00	56.6	77.4	98.3	72.7	47.9	45.4	43.7	43.2	40.8
05-09-18	09:45:00	00:14:59	46.8	63.1	89.3	54.5	48.9	45.5	43.4	42.8	40.5
05-09-18	10:00:00	00:15:01	45.1	59.7	84.3	51.6	46.6	44.4	42.6	42.1	39.6
05-09-18	10:15:00	00:14:59	45.0	55.8	77.7	48.7	46.8	44.6	42.7	42.2	40.2
05-09-18	10:30:00	00:15:02	57.6	80.1	100.3	72.2	51.6	46.9	44.9	44.4	42.7
05-09-18	10:45:00	00:15:00	46.6	61.9	85.8	54.4	48.1	45.2	43.5	43.1	41.9
05-09-18	11:00:00	00:15:00	46.5	65.3	79.0	51.3	47.2	45.9	44.7	44.4	43.1
05-09-18	11:15:00	00:14:59	45.7	53.5	77.1	49.3	47.1	45.4	44.1	43.8	42.3
05-09-18	11:30:00	00:14:59	58.7	82.3	101.5	73.6	51.2	46.0	44.4	44.0	42.5
05-09-18	11:45:00	00:15:01	46.5	59.6	83.5	55.9	47.6	45.0	42.0	41.6	40.1
05-09-18	12:00:00	00:15:00	46.6	58.4	87.7	53.8	48.3	46.1	42.7	42.1	40.2
05-09-18	12:15:00	00:15:00	54.0	78.0	99.9	60.2	49.0	46.3	44.6	44.2	42.2
05-09-18	12:30:00	00:15:00	55.0	79.3	100.8	61.6	49.9	46.9	45.2	44.9	43.2
05-09-18	12:45:00	00:14:59	47.5	67.5	82.0	55.5	48.5	46.3	44.7	44.2	42.4
05-09-18	13:00:00	00:02:56	62.6	88.9	107.6	72.2	63.6	46.7	44.9	44.6	41.4

13-09-18



Measurement Summary Report

Name 1 x condenser @ 1m

Time 05-09-18 09:44:04

Person

Place

Project

Duration 00:01:33

Jacques Way,

Instrument G068016, CR:171B

Calibration

Before 05-09-18 09:38

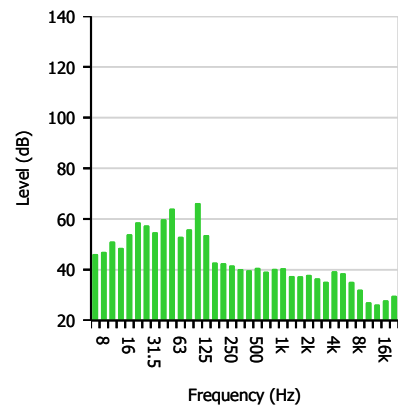
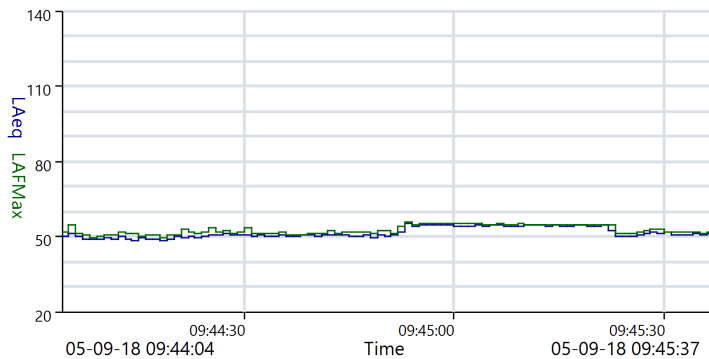
Offset -0.08 dB

After

05-09-18 15:46

Offset 0.58 dB

Basic Values		Statistical Levels (Ln)	
L _{Aeq}	52.0 dB	LAF1	54.9 dB
L _{AE}	71.7 dB	LAF5	54.6 dB
L _{AFMax}	55.7 dB	LAF10	54.4 dB
		LAF50	50.7 dB
		LAF90	49.0 dB
		LAF95	48.4 dB
		LAF99	47.3 dB



ReportId



M59A101000001CE

Cirrus Research NoiseTools

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