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Environmental Noise Survey

Bio Agrigas,
The Downs,
Mullingar,
Co. Westmeath

October-December 2011

Client	Revision	Date	Compiled	Checked	Approved
Bio-Agrigas	A	05/12/2011	MOC	DC	
Newdown, The Downs Mullingar Co. Westmeath					

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Executive Summary

An Environmental noise survey was conducted at the five noise sensitive locations surrounding the proposed site of the Bio-Agrigas Plant at The Downs, Mullingar, Co. Westmeath. This survey was conducted as part of a further information request by Westmeath County Council (planning ref#11/5055). The survey was conducted between October and December 2011 at five locations: (Monaghans NSL1), (Murtaghs NSL2), (Flynns NSL3), (Carrolls NSL4) & (Flynns NSL5). The noise survey consisted of both daytime and night-time monitoring to ensure statistically representative figures.

The purpose of the noise survey was to establish base noise levels in the surrounding areas. As the proposed plant will eventually be IPPC licensed, noise monitoring is a key element of any facility maintaining its license. These baseline figures will be a good resource in reflecting the expected noise levels in the surrounding areas.

While some tonal qualities were recorded at any monitoring locations, these were not persistent over the monitoring period and were due to unexpected noise sources which will be detailed in the report.

1 Scope

ORS Environmental Consultants were commissioned by Thomas Flynn of Bio-Agrigas Ireland to conduct a Daytime and Night-time broadband; one-third octave noise broadband survey at 5 predetermined noise sensitive monitoring locations in Newdown, The Downs, Mullingar, Co. Westmeath. All tests were carried out at both, during day-time and night-time. The site of the proposed plant is located to the north of the existing commercial premises, with the surrounding lands mainly of agricultural at Newdown, The Downs Mullingar, off the Dublin Sligo Road (N4). The site is bounded to the north by the regional road, The Downs to Killucan (R156), to the east by agricultural land, to the west by agricultural lands and the proposed N4 The Downs Grade Separation and to the south by the N4 Dual Carriageway. The plant is located approximately 7km from the town of Mullingar.

2 Monitoring Locations

Environmental noise monitoring was carried out at locations NSL1, NSL2, NSL3, NSL4, & NSL5. The survey was conducted during the daytime operation of the business which is presently there. The proposed plant typically will be in operation 24hrs a day all year round. The monitoring locations are detailed below in Table 1 and presented in the attached map in Appendix B.

Table 1: Noise Monitoring Locations

Monitoring Location	Description
NSL1 (Monaghans)	This two storey dwelling is located approximately 600m to the northwest of the proposed plant
NSL2 (Murtaghs)	Murtagh's Piggery is approximately 300m due north of the proposed plant.
NSL3 (Flynns)	This is directly beside the proposed plant location. There is one residential family home located here.
NSL4 (Carrolls)	Two storey family dwelling located 600m to the SW of the proposed site.
NSL5 (Quinns)	Detached Bungalow situated 500m to the SSW of the proposed site.

3 Activities on Site

Activities which took place at the existing site consisted of grain drying silos and mechanically driven machines for the production of animal feeds. Other activities on site included some light plant machinery (i.e. Fork-lifts, HGV), operating around the yard.

4 Durations & Measurements of Surveying

In accordance with EPA Guidelines Documents-(Environmental Noise Survey 2003), sampling was conducted over different days and at different times during the day to ensure that the survey was statistically representative. A series of measurements were undertaken over a typical period of 4 hours during daytime and over a minimum of 2 hours during night-time. As the facility is not built as present, a period which represented typical or worst-case operational conditions could not be monitored. In this instance that will be addressed by using prediction modeling software (Predictor Software Suite Type 7810). The software is approved and has been used by the EPA, to forecast noise levels in the surrounding areas where the plant will be operational. For the purpose of this report, Daytime monitoring hours refer to hours between 08.00 and 22:00. Night-time hours refer to hours between 22:00 and 08:00. The following measurement was carried out at each location:

- Day and Night-time Broadband measurements LAeq, LA10, and LA90, over a 4hrs (Daytime) & 2hrs (Night time) minute period.
- 1/3 octave band frequency analysis.

5 Weather Conditions

While every effort was made to carry out the survey in accordance with the requirements of ISO 1996: Acoustics – Description and Measurement of Environmental Noise and the Environmental Protection Agency 'Environmental Noise Survey Guidance Document', regarding weather conditions, it should be noted that this is not always possible.

Ideally, measurements should be taken in 'neutral' weather conditions. This means in the absence of wind and precipitation, and ideally in conditions of standard temperature and pressure. Clearly, these conditions very rarely apply. The noise monitor was fitted with a windshield throughout the survey. An average wind speed of less than 5m/sec is the preferred limit when noise measurements are being taken, with 7m/sec an upper limit. On the days in question, wind speed was within limits. In as far as possible, care was be taken to avoid measurements so close to objects as to give rise to wind-derived noises, e.g. trees, pylons, etc.

Weather information was taken from the automatic Met-Eireann weather station, located at Mullingar Co.Westmeath. Weather conditions varied slightly during the monitoring period. Monitoring was conducted over a two month period because:

a) Weather Conditions were not suitable
b) Duration of Monitoring Periods

All other Meteorological conditions detailed below are within normal monitoring ranges. Wind speed is provided in metres per second.

Table 2: Met Eireann Data (Mullingar) - Daytime

Location	Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Gusts (knots)	Mean Windspeed (m/s)
NSL 1	26/10/11	0.1	11.1	2	-2.8	-	3.4
NSL 2	13/10/11	0.1	18	11.2	10.9	-	2.5
NSL 3	12/10/11	1.1	16.9	11.6	11.2	-	2.6
NSL 4	18/10/11	2.7	11	4	1.5	-	3.9
NSL 5	19/10/11	1.6	9.5	2.9	-1	-	2.7

Table 3: Met Eireann Data (Mullingar) – Night time							
Location	Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Gusts (knots)	Mean Windspeed (m/s)
NSL 1	06/12/11	2.4	7.1	0.6	-2.2	-	3.7
NSL 2	05/12/11	0.6	4.8	0.5	-1	-	3.8
NSL 3	07/12/11	1	6.1	1.4	-0.9	-	4.1
NSL 4	15/11/11	0	12.9	5.6	1.3	-	2.6
NSL 5	17/11/11	7.5	12.9	4.4	-0.3	-	6.1

6 Instrumentation & Methodology

Measurements were made using a Bruel & Kjaer 2250 integrating sound level meter (SLM) with selective 1:1 or 1:3 octave band filters. Calibration was carried out on site using a Bruel & Kjaer acoustic calibrator at 94dB (A). The meter was calibrated before and after the monitoring round. Factory calibration certificates for the SLM and the acoustic calibrator, detailing equipment serial numbers, calibration traceability and recalibration dates are presented in Appendix C of this report. A "Windshield" was also fitted to the sound meter at all stages of monitoring.

The sound level meter was mounted at 1.5m above ground level. A sample period for the noise measurements was selected to be 4hrs (Daytime) & 2hrs (Night time).

7 Glossary of Terms

Ambient noise: The total encompassing sound in a given situation at a given time usually composed of sound from many sources, near and far.

Background Noise Level: The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T. (L_{A90}, T).

Criterion Noise Level: The long-term mean value of the noise level that must not be exceeded. This is generally stipulated in the waste permit and it may be applied to a noise source, a boundary of the activity or to noise sensitive locations in the vicinity of the facility.

1/3 Octave Band Analysis: Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one–third of an octave each. An octave is taken to be a frequency interval, the upper limit of which is twice the lower limit (the unit of frequency is the Hertz, Hz).

dB (decibel): The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).

dBA or dB(A): An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Facade Level: Noise levels at locations 1m from the facade of a building are described by the term *Facade Levels* and are subject to higher noise levels than those in open areas (free-field conditions) due to reflection effects.

Free-field Conditions: These are conditions in which the radiation from sound sources is unaffected by the presence of any reflecting boundaries. In practice, it is a field in which the effects of the boundaries are negligible over the frequency range of interest. In environmental noise, true free-field measurement conditions are seldom achieved and generally the microphone will be positioned at a height between 1.2 and 1.5 metres above ground level. To minimise the influence of reflections, measurements are generally made at least 3.5 metres from any reflecting surface other than the ground.

Hz (Hertz): The unit of sound frequency in cycles per second.

Impulsive Noise: A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background. In determining whether a tonal adjustment applies, reference must be made to ISO 1996-2 (1987) - Section 4.1.

Impulse Exponential – Time-Weighting: This is a time-weighting which is available on some sound level meters and it represents an arbitrary compromise in an attempt to provide a means to measure the sound level of short-duration impulsive sounds. Impulse time-weighting has a design goal exponential-time constant of 35 ms for sound signals that increase with increasing time and 1.5 seconds for sound signals that decrease with increasing time.

LAeq,T: The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T.

LAmax: The maximum RMS, A-Weighted sound pressure level occurring within a specified time period; the time weighting fast or slow is usually specified.

Noise: Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a subject exposed to it, or any sound, that could to cause actual physiological harm to a subject exposed to it, or physical damage to any structure exposed to it, is known as noise.

Noise Sensitive Location: Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

Rating level (LAr,T) : 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 source is suppressed to a degree such that it does not contribute to the ambient noise (residual noise level is measured in terms of LAeq, T).

Root Mean Square (RMS): The RMS value of a set of numbers is the square root of the average of their squares.

Sound Exposure Level (SEL or LAE): Is the measure of the A-Weighted sound energy used to describe noise events such as the passing of a train or aircraft; it is the A-weighted sound pressure level if occurring over a period of 1 second, would contain the same amount of A-weighted sound energy as the event.

Specific noise level: A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval (LAeq, T)'.

Time-weighting: One of the averaging times (Fast, Slow or Impulse) used for the measurement of RMS sound pressure level in sound level meters.

Tonal Noise: Noise which contains a clearly audible tone, i.e. a distinguishable, discrete or continuous note (whine, hiss screech or hum etc.). In determining whether a tonal adjustment applies, reference must be made to ISO 1996-2 (1987) - Section 4.

8 Noise Measurement Data

Table 4: Daytime Monitoring Data Oct-Dec 2011		
Monitoring Location	**Time**	**$L_{Aeq,4hrs}$ dB(A)**
NSL 1	11:37 – 15:37	57
NSL 2	13:04 – 17:04	57
NSL 3	09:42 – 13:42	63
NSL 4	11.49 – 15.49	67
NSL 5	10.46 – 14.46	58

Table 5: Night time Monitoring Data Oct-Dec 2011		
Monitoring Location	**Time**	**$L_{Aeq,2hrs}$ dB(A)**
NSL 1	22.03-00.03	56
NSL 2	22.38-00.38	56
NSL 3	22.37-00.37	61
NSL 4	22.49 – 00.49	48
NSL 5	01.10 – 03.10	60

		Table 6: 1/3 Octave Band Analysis (12.50Hz – 400.00Hz)											(Daytime)			
Monitoring Location	12.50 Hz	16.00 Hz	20.00 Hz	25.00 Hz	31.50 Hz	40.00 Hz	50.00 Hz	63.00 Hz	80.00 Hz	100.00 Hz	125.00 Hz	160.00 Hz	200.00 Hz	250.00 Hz	315.00 Hz	400.00 Hz
NSL 1	-6	1	5	10	15	19	25	31	33	34	32	33	34	35	36	39
NSL 2	-8	-2	4	12	19	21	26	30	32	35	36	37	41	39	42	43
NSL 3	-5	2	8	17	22	30	33	43	41	45	44	48	46	44	44	45
NSL 4	17	21	25	28	31	33	34	36	36	35	35	34	35	39	47	44
NSL 5	4	9	13	17	21	24	28	34	36	36	35	36	37	37	37	38

		Table 7: 1/3 Octave Band Analysis (500.00Hz – 16000.00Hz)											(Daytime)			
Monitoring Location	500.00 Hz	630.00 Hz	800.00 Hz	1000.00 Hz	1250.00 Hz	1600.00 Hz	2000.00 Hz	2500.00 Hz	3150.00 Hz	4000.00 Hz	5000.00 Hz	6300.00 Hz	8000.00 Hz	10000.00 Hz	12500.00 Hz	16000.00 Hz
NSL 1	45	49	50	51	50	47	43	39	34	29	26	21	15	8	4	3
NSL 2	45	46	47	49	47	47	45	43	41	40	37	35	33	29	23	17
NSL 3	49	56	53	52	51	57	48	46	46	43	42	41	40	29	32	19
NSL 4	52	61	60	64	53	54	54	52	44	45	37	32	29	26	22	18
NSL 5	43	47	51	52	50	47	43	39	36	32	28	25	20	16	10	7

		Table 8: 1/3 Octave Band Analysis (12.50Hz – 400.00Hz)											(Night time)			
Monitoring Location	12.50 Hz	16.00 Hz	20.00 Hz	25.00 Hz	31.50 Hz	40.00 Hz	50.00 Hz	63.00 Hz	80.00 Hz	100.00 Hz	125.00 Hz	160.00 Hz	200.00 Hz	250.00 Hz	315.00 Hz	400.00 Hz
NSL 1	9	13	16	20	23	25	29	33	35	34	32	32	32	33	34	37
NSL 2	2	6	10	14	17	22	26	32	32	32	33	32	34	36	38	40
NSL 3	-7	-2	4	14	15	20	26	31	34	35	36	36	36	33	33	36
NSL 4	-11	-6	-2	3	8	15	18	24	27	25	23	22	23	25	27	29
NSL 5	-10	-1	4	12	14	18	23	30	32	33	32	33	34	34	35	38

		Table 9: 1/3 Octave Band Analysis (500.00Hz – 16000.00Hz)											(Night time)			
Monitoring Location	500.00 Hz	630.00 Hz	800.00 Hz	1000.00 Hz	1250.00 Hz	1600.00 Hz	2000.00 Hz	2500.00 Hz	3150.00 Hz	4000.00 Hz	5000.00 Hz	6300.00 Hz	8000.00 Hz	10000.00 Hz	12500.00 Hz	16000.00 Hz
NSL 1	42	46	49	51	49	46	41	35	30	25	21	18	14	10	6	3
NSL 2	44	46	49	51	49	46	42	37	34	31	28	26	23	19	14	9
NSL 3	43	48	53	56	54	50	45	40	35	29	23	19	14	10	5	3
NSL 4	33	36	40	43	41	38	33	27	21	15	12	11	8	6	4	3
NSL 5	44	48	53	55	53	51	47	41	35	30	23	19	14	10	6	3

9 Interferences

Below is a comprehensive breakdown of all the noise interference/sources, which occurred at all monitoring locations during the Environmental Noise Survey

Noise Sources/Interferences – (Daytime)	
Location/Date	
NSL 1/26th Oct	Main source of noise at this location was the busy Regional Road (R156) The Downs-Killucan. It was also noted that the house next door had two loud barking dogs also.
NSL 2/13th Oct	Regional Road (R156) also runs very close to these premises. Other noise sources included background noise from the piggery itself.
NSL 3/12th Oct	This is a very busy yard at Flynn Machinery Depot. Large HGV vehicles were the main noise source at the monitoring point.
NSL 4/18th Oct	On the day in question, the prevailing wind was Northwest. This meant that noise sources from Flynns Machinery Depot were clearly audible, albeit faint.
NSL 5/19th Oct	This particular house is situated right on the boundary of the very busy N4 dual carriageway (Dublin-Sligo). As there is a large amount of traffic on the road at all times, a prominent and constant noise arising from the road itself exists. This was determined to be the main source of noise at this location.

Noise Sources/Interferences – (Night time)	
Date	
NSL 1/6th Dec	It was noted that a southwesterly wind was blowing on the night monitoring took place. There was only one main noise source noted, and that was the N4 Dual Carriageway. Vehicular noise travelled across the flat open fields and was clearly audible at this site.

NSL 2/05th Dec	It was noted that a southwesterly wind was blowing on the night monitoring took place. There was only one main noise source noted, and that was the N4 Dual Carriageway. Vehicular noise travelled across the flat open fields and was clearly audible at this site.
NSL 3/7th Dec	NSL 3 is located only a few hundred yrds from the N4 dual carriageway. Main source of noise at this location came from passing traffic on this road. Also, the homeowners' dogs were barking for long periods.
NSL 4/15th Nov	Background noise included low frequency rumbling noise from the N4 Dual Carriageway which is located close to the dwelling. Birdsong and rustling foliage was also present.
NSL 5/17th Nov	Reasonably sustained southwesterly breeze blowing on this night. Wind speed was getting near the limits, but was still within EPA Guidelines for weather conditions. Southwesterly wind meant all traffic noise from adjoining N4 Dual Carriageway was being carried directly towards the monitoring location

10 Evaluation of Measurement Data

Table 4 through 9 summarises the Daytime and Nighttime broadband and 1/3 octave measurements for all monitoring locations surveyed. Each location was monitored for 4hrs during the daytime, and 2hrs during the night time.

Day Monitoring Oct-Dec 2011

NSL1

At monitoring location NSL1, a L_{Aeq} of **57dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL2

At monitoring location NSL2, a L_{Aeq} of **57dB (A)** was recorded during the monitoring period. There was some tonal noise qualities present at this location. This, however was attributed to a once of noise source on site, as tonal qualities were not repeated at any other stage during the noise monitoring survey.

NSL3

At monitoring location NSL3, a L_{Aeq} of **63dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL4

At monitoring location NSL4, a L_{Aeq} of **67dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL5
At monitoring location NM5, a L_{Aeq} of **58dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

Night Monitoring Oct-Dec 2011

NSL1
At monitoring location NSL1, a L_{Aeq} of **56dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL2
At monitoring location NSL2, a L_{Aeq} of **56dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL3
At monitoring location NSL3, a L_{Aeq} of **61dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL4
At monitoring location NSL4, a L_{Aeq} of **48dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

NSL5
At monitoring location NSL5, a L_{Aeq} of **60dB (A)** was recorded during the monitoring period. There was no tonal noise qualities present at this location.

11 Conclusions

Overall it can be concluded that the baseline noise measurements for the surrounding area fall approximately between 45-65dB. ORS have determined that the majority of noise sources at all the monitoring locations arose from the N4 Dual Carriageway. While tonal noise qualities were present at one location, this was a once off occurrence, and therefore is not seen as of any influence. No tonal or impulse qualities were noted at any of the other noise monitoring locations.

Appendix A – Noise Measurement Graphs

NSL1 Day

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		10/26/2011 11:37:21
End Time:		10/26/2011 15:37:21
Elapsed Time:		04:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.70

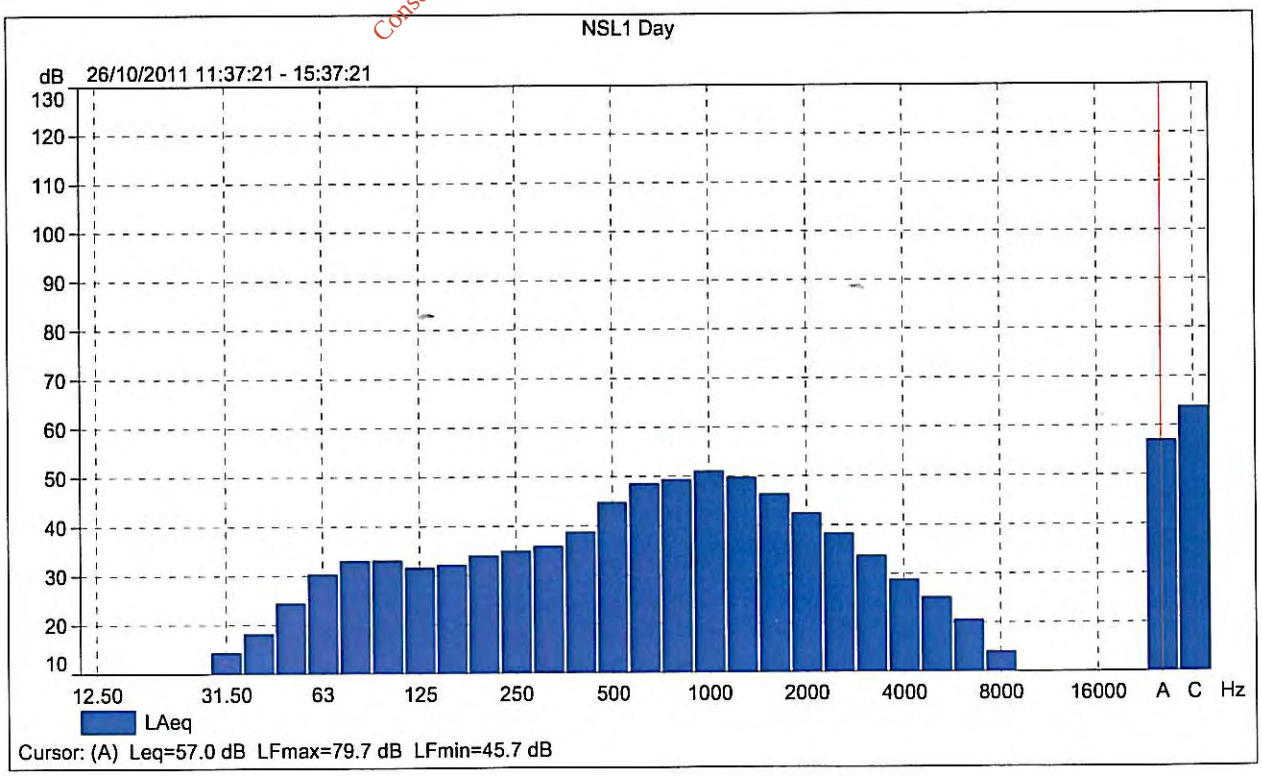
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		10/26/2011 11:35:47
Calibration Type:		External reference
Sensitivity:		51.5193045139313 mV/Pa

NSL1 Day

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	57.0	79.7	45.7
Time	11:37:21	15:37:21	4:00:00				
Date	26/10/2011	26/10/2011					



NSL2 Day

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		10/13/2011 13:04:22
End Time:		10/13/2011 17:04:22
Elapsed Time:		04:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.72

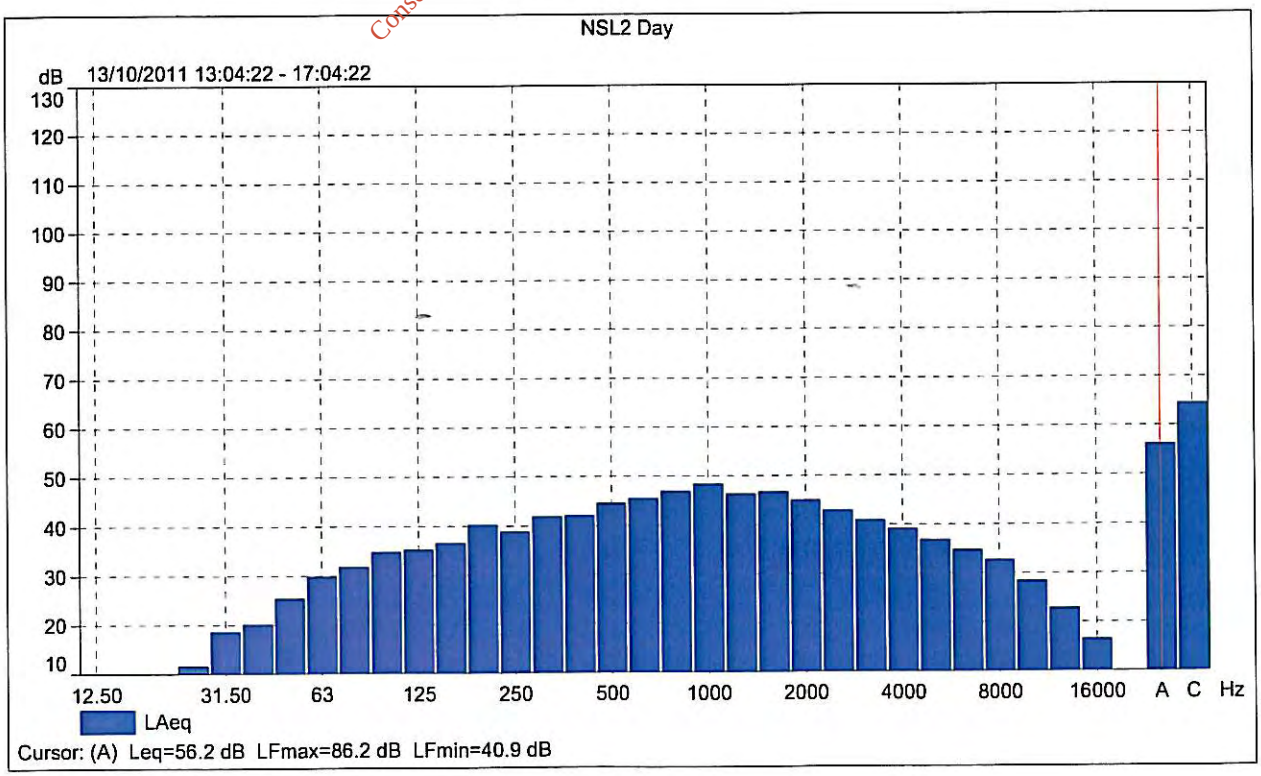
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		10/13/2011 13:03:02
Calibration Type:		External reference
Sensitivity:		51.3570420444012 mV/Pa

NSL2 Day

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	56.2	86.2	40.9
Time	13:04:22	17:04:22	4:00:00				
Date	13/10/2011	13/10/2011					



NSL3 Day

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		10/12/2011 09:42:47
End Time:		10/12/2011 13:42:47
Elapsed Time:		04:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.61

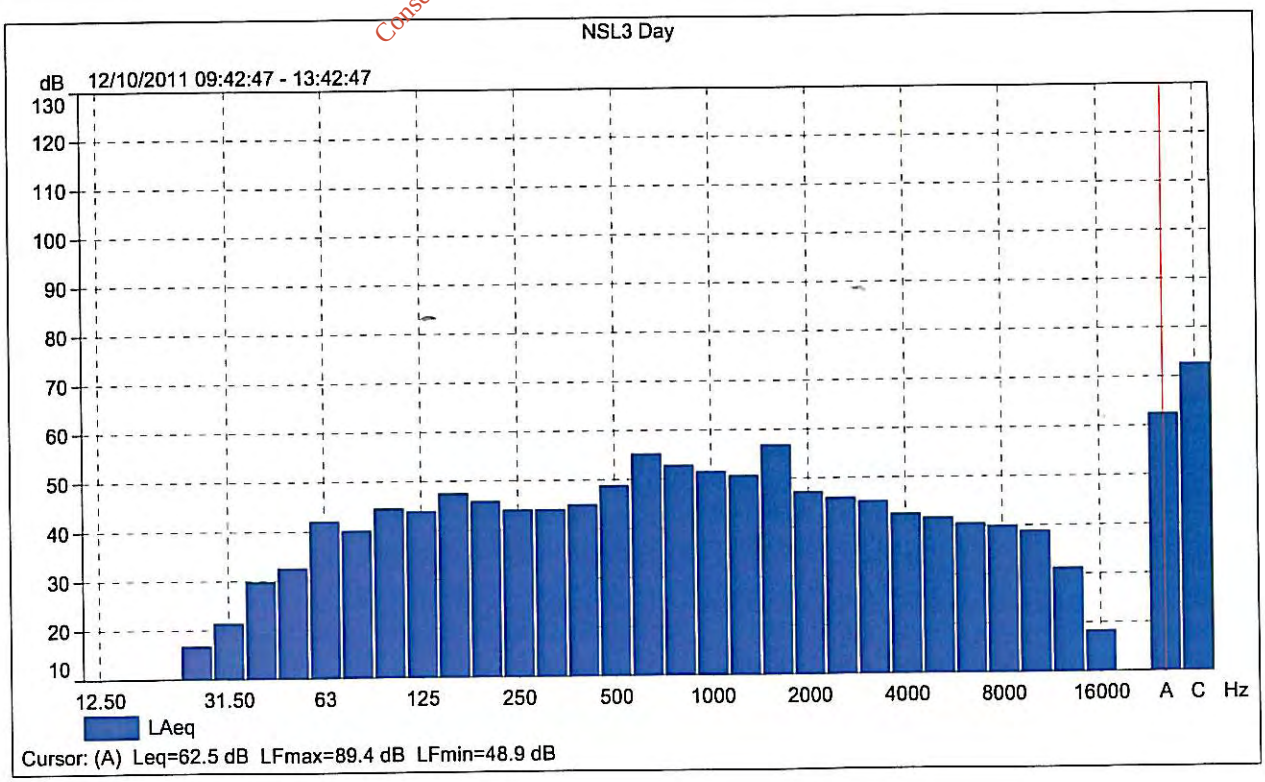
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		10/12/2011 09:41:13
Calibration Type:		External reference
Sensitivity:		52.0583018660545 mV/Pa

NSL3 Day

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	62.5	89.4	48.9
Time	09:42:47	13:42:47	4:00:00				
Date	12/10/2011	12/10/2011					



NSL4 Day

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		10/18/2011 11:49:03
End Time:		10/18/2011 15:49:03
Elapsed Time:		04:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.71

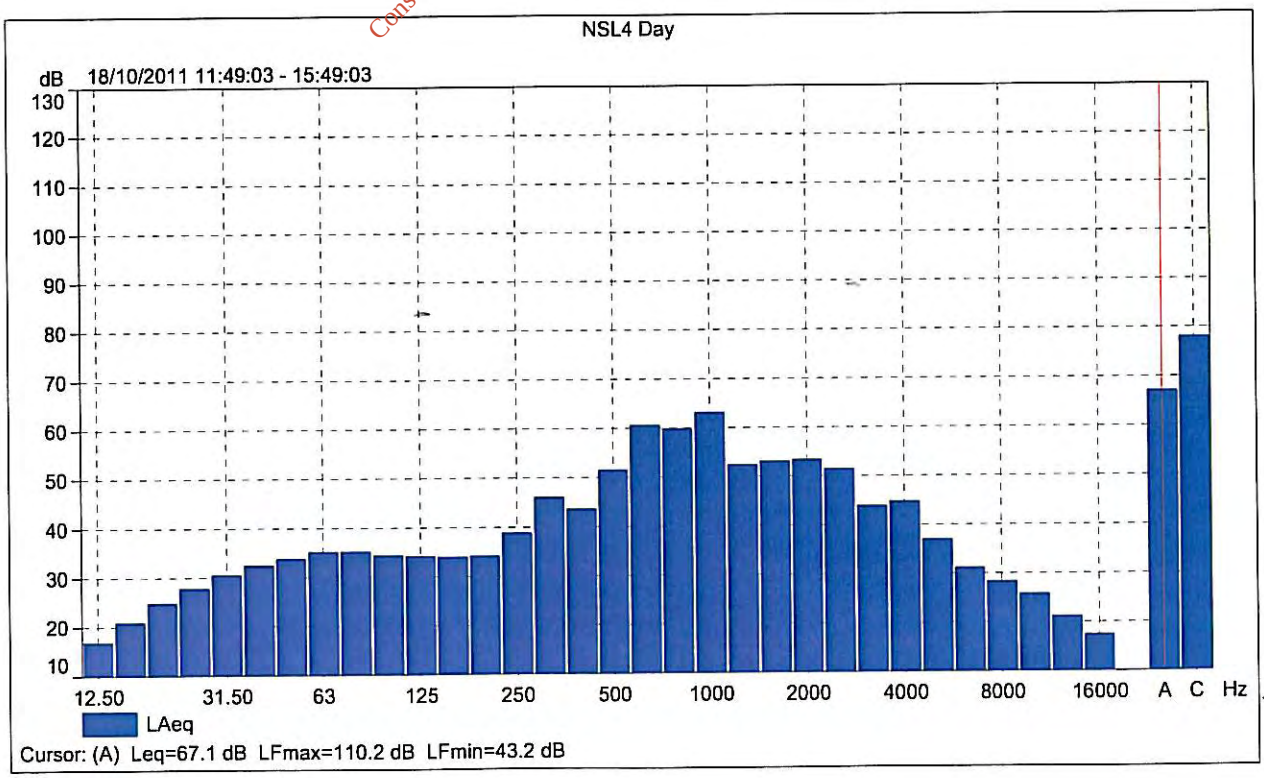
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		10/18/2011 11:39:58
Calibration Type:		External reference
Sensitivity:		51.3641387224197 mV/Pa

NSL4 Day

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	67.1	110.2	43.2
Time	11:49:03	15:49:03	4:00:00				
Date	18/10/2011	18/10/2011					



NSL5 Day

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		10/19/2011 10:46:02
End Time:		10/19/2011 14:46:02
Elapsed Time:		04:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.73

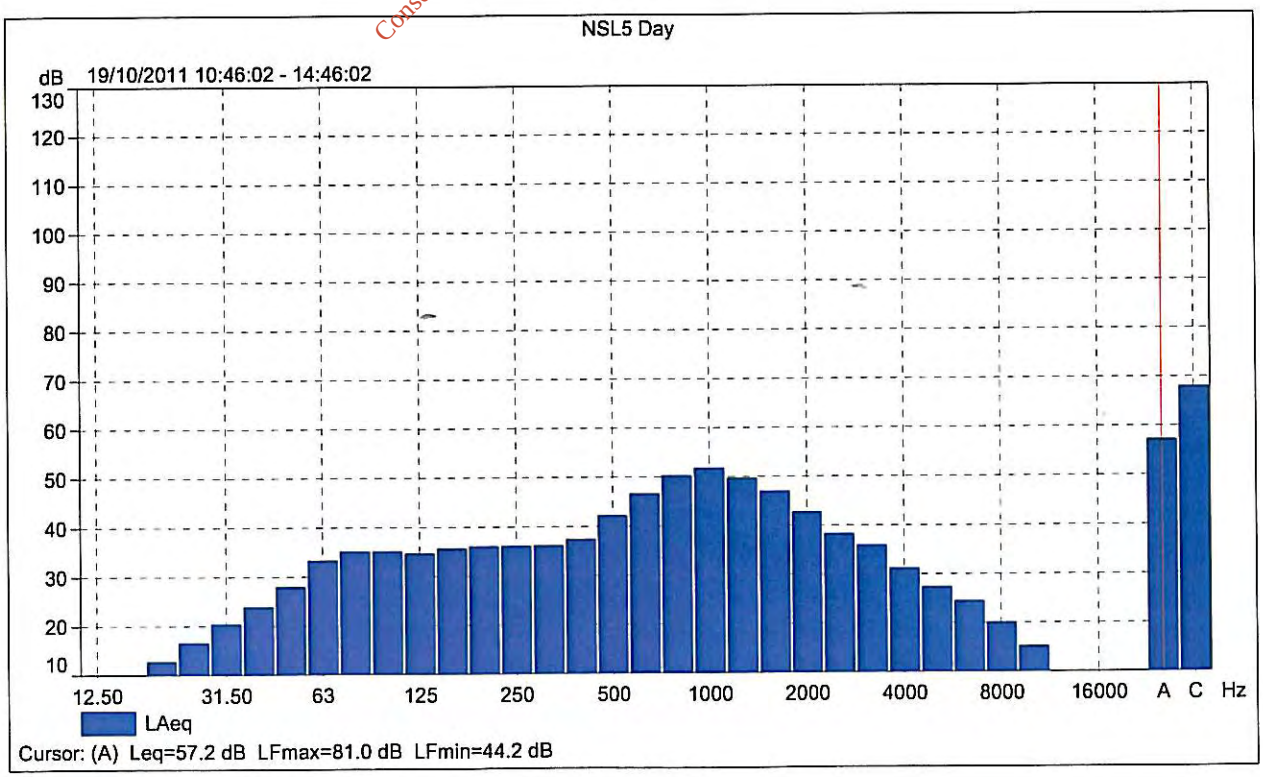
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		10/19/2011 10:44:40
Calibration Type:		External reference
Sensitivity:		51.3062179088593 mV/Pa

NSL5 Day

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	57.2	81.0	44.2
Time	10:46:02	14:46:02	4:00:00				
Date	19/10/2011	19/10/2011					



NSL 1 Night

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		12/06/2011 22:03:33
End Time:		12/07/2011 00:03:33
Elapsed Time:		02:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.78

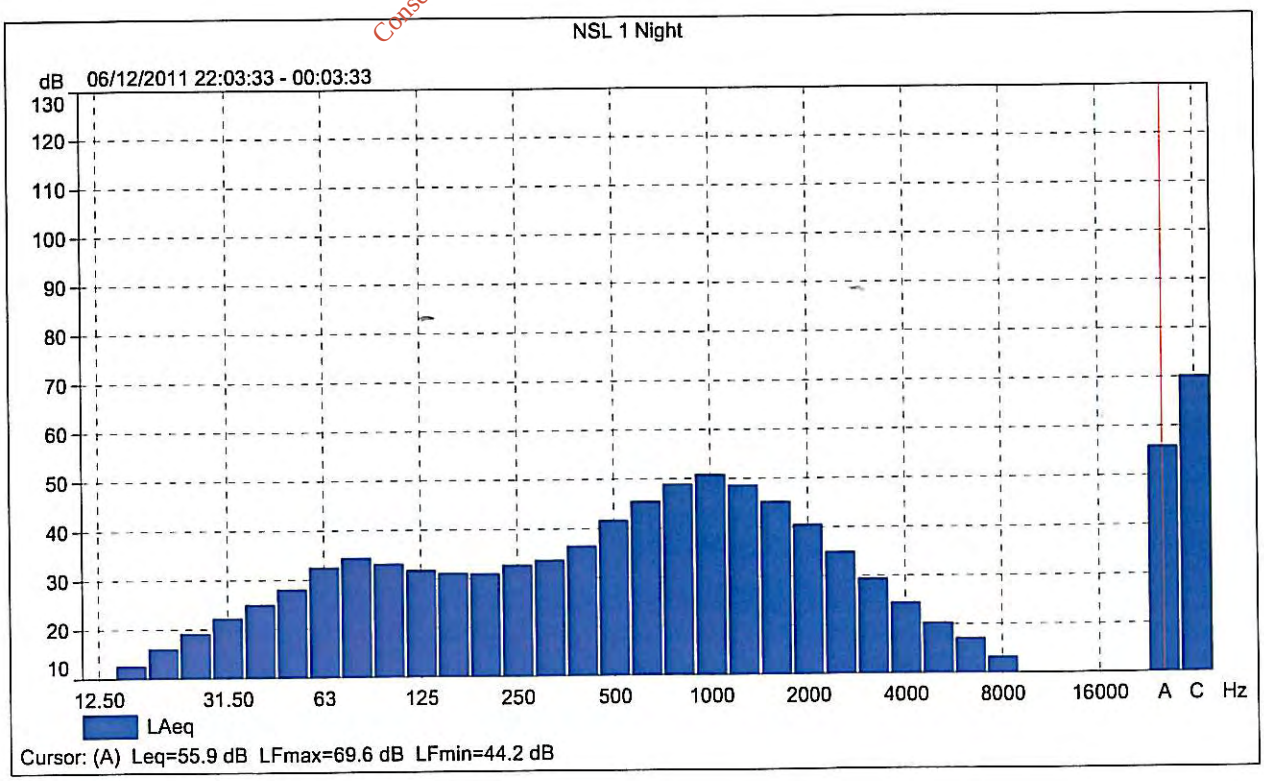
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		12/06/2011 22:01:25
Calibration Type:		External reference
Sensitivity:		51.0469749569893 mV/Pa

NSL 1 Night

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	55.9	69.6	44.2
Time	22:03:33	00:03:33	2:00:00				
Date	06/12/2011	07/12/2011					



NSL 2 Night

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		12/05/2011 22:38:35
End Time:		12/06/2011 00:38:35
Elapsed Time:		02:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.69

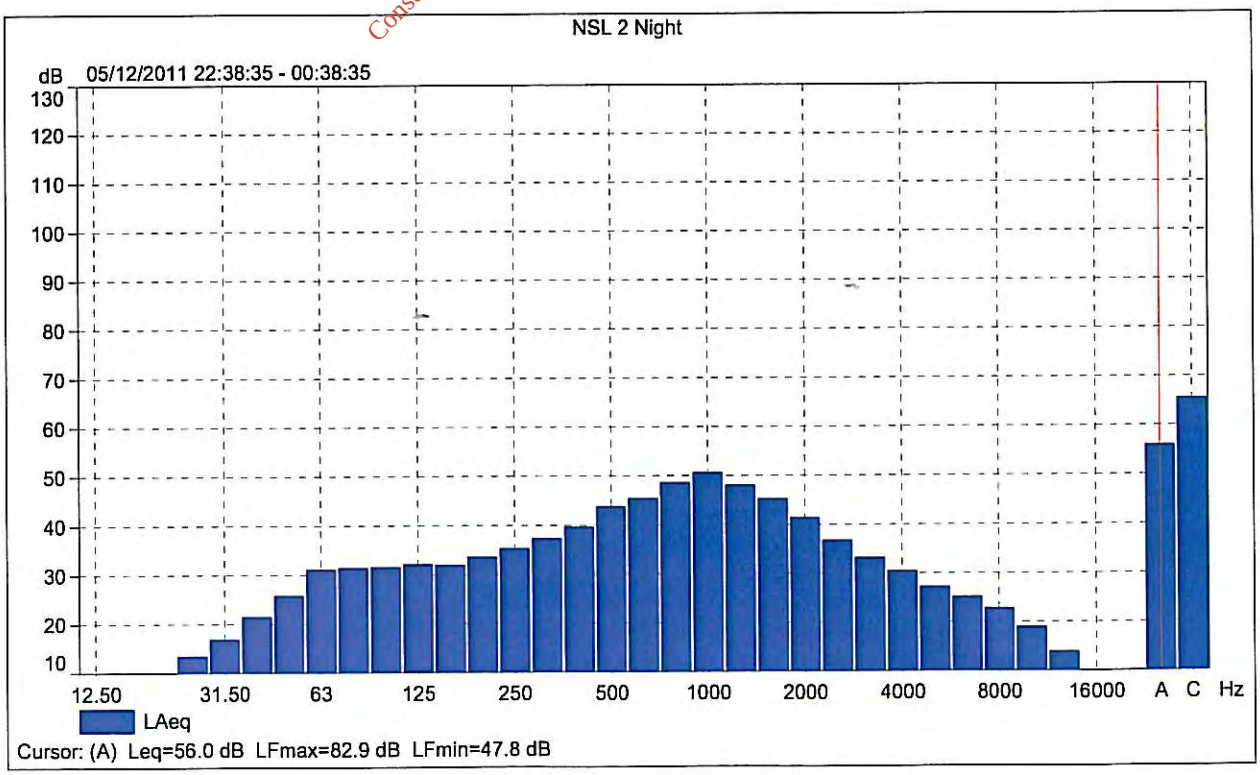
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		12/05/2011 22:36:21
Calibration Type:		External reference
Sensitivity:		51.5264235436916 mV/Pa

NSL 2 Night

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	56.0	82.9	47.8
Time	22:38:35	00:38:35	2:00:00				
Date	05/12/2011	06/12/2011					



NSL3 Night

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		12/07/2011 22:37:10
End Time:		12/08/2011 00:37:10
Elapsed Time:		02:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.77

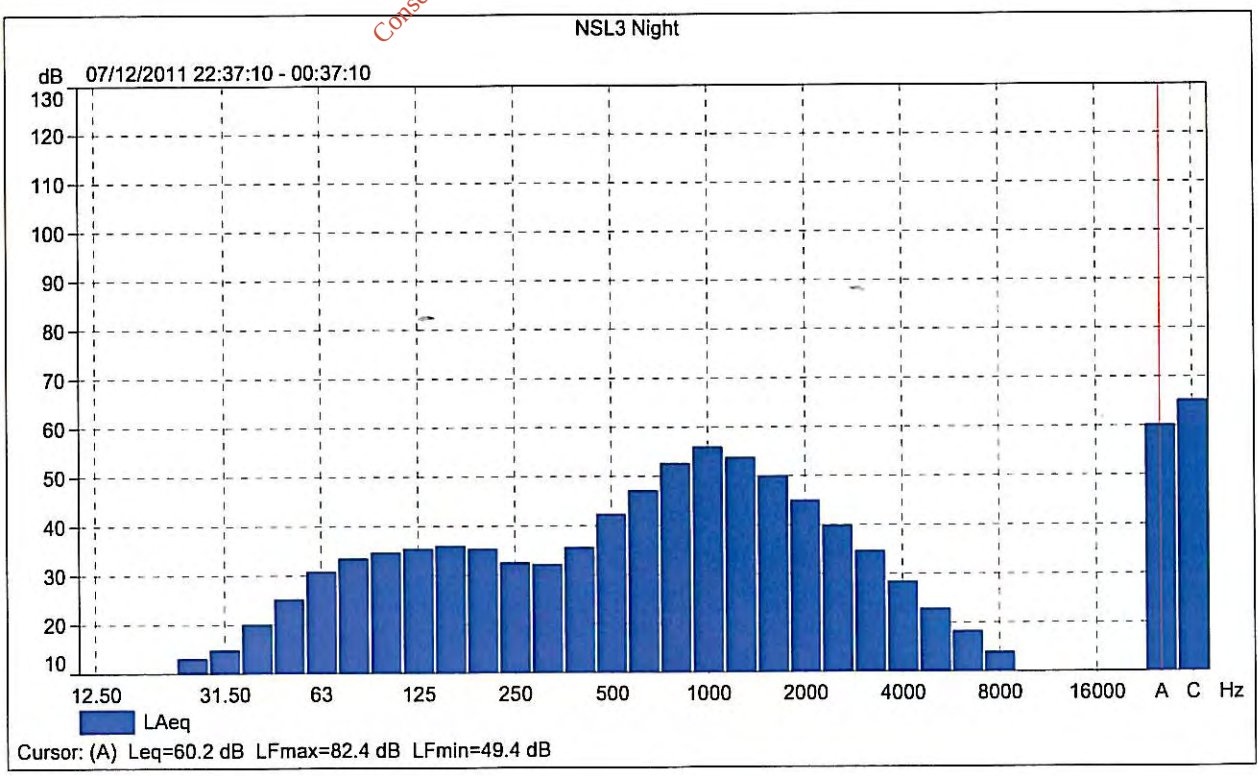
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		12/07/2011 20:36:05
Calibration Type:		External reference
Sensitivity:		51.0857775807381 mV/Pa

NSL3 Night

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	60.2	82.4	49.4
Time	22:37:10	00:37:10	2:00:00				
Date	07/12/2011	08/12/2011					



NSL4 Night

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		11/15/2011 22:49:06
End Time:		11/16/2011 00:49:06
Elapsed Time:		02:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.68

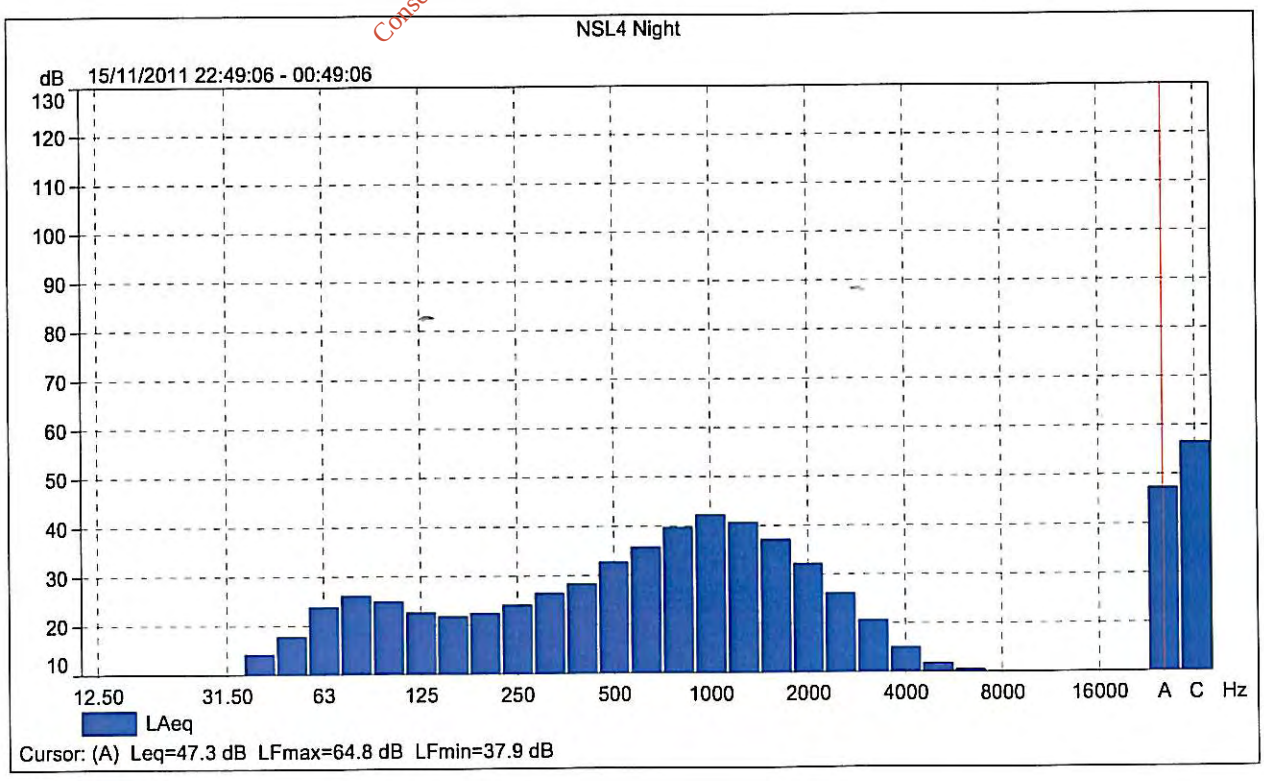
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		11/15/2011 22:46:43
Calibration Type:		External reference
Sensitivity:		51.6059771180153 mV/Pa

NSL4 Night

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	47.3	64.8	37.9
Time	22:49:06	00:49:06	2:00:00				
Date	15/11/2011	16/11/2011					



NSL5 Night

Instrument:		2250-L
Application:		BZ7132 Version 3.0.1
Start Time:		11/17/2011 01:10:12
End Time:		11/17/2011 03:10:12
Elapsed Time:		02:00:00
Bandwidth:		1/3-octave
Max Input Level:		140.68

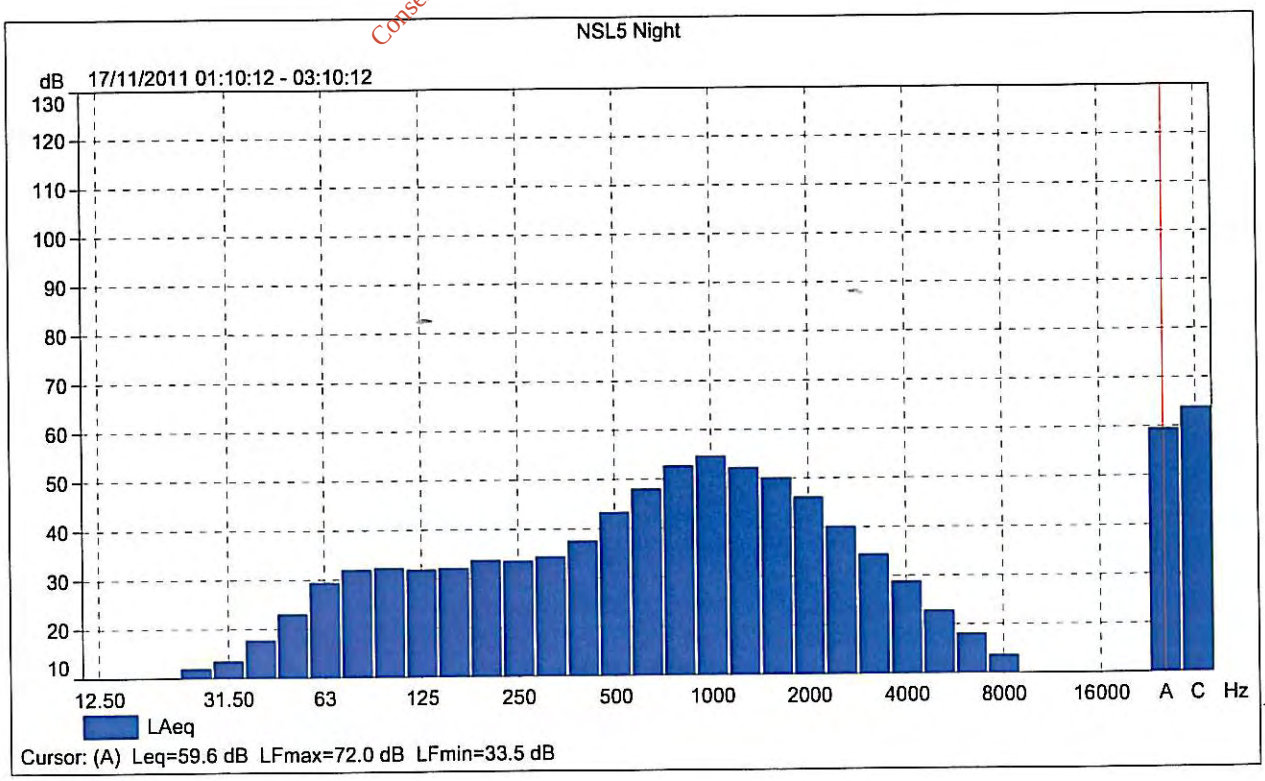
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	A

Instrument Serial Number:		2602719
Microphone Serial Number:		2600864
Input:		
Windscreen Correction:		UA-0237
Sound Field Correction:		Free-field

Calibration Time:		11/15/2011 22:46:43
Calibration Type:		External reference
Sensitivity:		51.6059771180153 mV/Pa

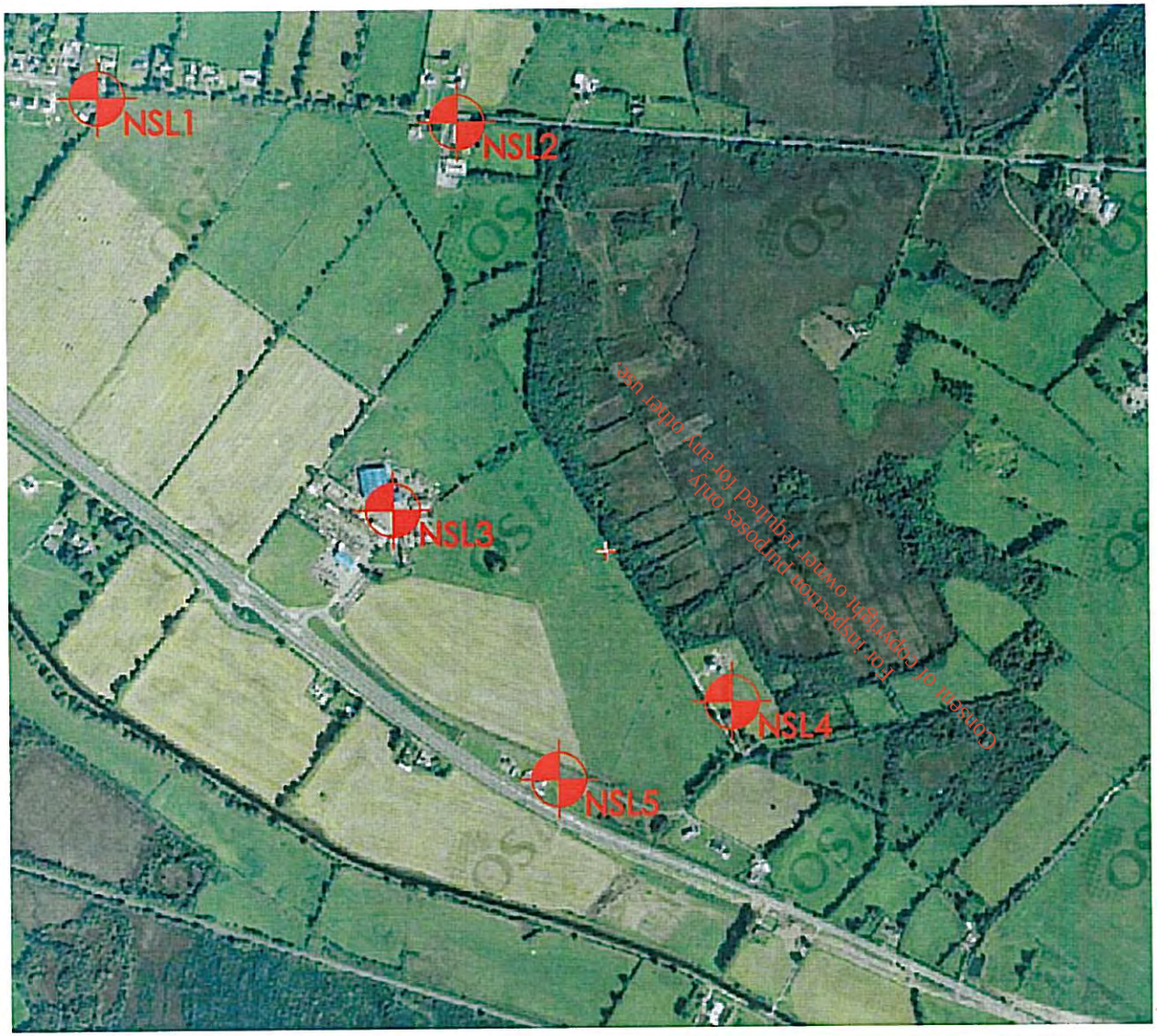
NSL5 Night

	Start time	End time	Elapsed time	Overload [%]	LAeq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	59.6	72.0	33.5
Time	01:10:12	03:10:12	2:00:00				
Date	17/11/2011	17/11/2011					



Appendix B – Noise Monitoring Locations

A3



LEGEND	
	BOUNDARY LINE
N_{Mx}	NOISE MONITORING LOCATIONS
NSL	NOISE SENSITIVE LOCATIONS
D_{Mx}	DUST MONITORING LOCATIONS
SWx	SURFACEWATER MONITORING LOCATIONS
GWx	GROUNDWATER MONITORING LOCATIONS
	EXISTING WELL/BOREHOLE
V_{Mx}	VIBRATION MONITORING LOCATIONS
A_{Mx}	AIR MONITORING LOCATIONS
	EXISTING SURFACE WATER PIPES
	EXISTING FOUL SEWER PIPES
	EXISTING WATERMAIN
	EXISTING MANHOLE
F	FOUL SEWER
S	SURFACE WATER
	EXISTING BUILDING
	PROPOSED BUILDING
	NORTH POINT

N

CLIENT	BIOAMBIGAS
PROJECT	PROPOSED BIOENERGY FACILITY AT NEWDOWNS,THE DOWNS
TITLE	NOISE MONITORING LOCATIONS
MOC	111_001_800
13/10/11	0001

ORS Consulting Engineers

IS EN ISO 9001:2008 Cert. no. 3334

Appendix C – Calibration Certificates

CERTIFICATE OF CALIBRATION

Date of issue: 08 September 2011 Certificate Number: C1107110

UKAS CALIBRATION
0174

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307. DK-2850 Nærum, Denmark
Tel: +45 45 800 500 Fax: +45 45 801 405
Email: ukservice@bksv.com

Nils Johansen
Approved Signatory

CALIBRATION OF:

Sound Level Calibrator: Brüel & Kjær Type 4231 No: 2605825 Id: -

Date of calibration: 07 September 2011

CUSTOMER:

ORS Consulting Engineers
Marlinstown Office Park
Mullingar
Co. Westmeath, Ireland

Customer Ref: Service Contract

CALIBRATION CONDITIONS:

Preconditioning: 5 hours at 23°C ± 3°C

Environment conditions: Air Temperature: 22.3 °C, Air Pressure: 99.8 kPa, Relative Humidity: 52 % RH.

SPECIFICATIONS:

The Sound Level Calibrator Brüel & Kjær Type 4231 has been calibrated in accordance with the requirements as specified in IEC60942:2003 Annex B.

PROCEDURE:

The measurements have been performed with the assistance of UKAS Calibrator Calibration System 150065 by using procedure TWI-104-DK.

RESULTS:

Unless otherwise stated herein, the reported uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements. The uncertainties refer to the measured values only with no account being taken of the ability of the device under test to maintain its calibration.

Note: Calibration as received.

CERTIFICATE OF CALIBRATION

UKAS ACCREDITED CALIBRATION LABORATORY No. 0174

Certificate Number:
C1107110

1. Visual Inspection

OK.

2. Procedure Description

Sound pressure level in the coupler of this calibrator was measured with a calibrated, laboratory grade condenser microphone specified in the certificate. In the case of 1/2 inch microphone, the 1/2 inch adaptor supplied with the calibrator was used. Choice of 1 or 1/2 inch microphone is specified in the customers order.

Sound pressure level measured was compared with sound pressure level generated in the coupler of a working standard pistonphone calibrated by the National Physical Laboratory using the same microphone and at the same ambient conditions.

Appropriate corrections for atmospheric pressure during calibration and for measurement system frequency and level response were taken into account.
Sound pressure level results given in the certificate are the mean of 5 measurements. Calibration results apply at ambient conditions during the process of calibration, which are given in the certificate.

3. Acoustic Measurements

Coupler Configuration	Microphone Type (without grid)	Output Level, dB re 20 µPa at ambient test conditions	+20 dB Level Step in dB	Frequency Hz *	Total Harmonic Distortion % *
1/2"	4180	94.03	20.02	1000.0	0.4
1"	-	-	-	-	-
Measurement Uncertainty	-	0.15	0.04	0.1	0.3

* Frequency and Distortion measurements are not covered by the UKAS accreditation, but is included for completeness.

4. Note

Manufacturers manual shall be consulted when the calibrator is used with free field microphones which are normally supplied with sound level meters.

This instrument was calibrated by: Lene Petersen.

End

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

DANAK
CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: C1107125 Page 1 of 10

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250 Light	No: 2602719 Id: -
Microphone:	Brüel & Kjær Type 4950	No: 2600864
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 6365
Supplied Calibrator:	Brüel & Kjær Type 4231	No: 2605825
Software version:	BZ7131 Version 3.0.1	Pattern Approval: PENDING
Instruction manual:	BE-1774-11	

CUSTOMER

ORS Consulting Engineers
Marlinstown Office Park
Mullingar
Co. Westmeath, Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 Light has been calibrated in accordance with the requirements as specified in IEC61672-1:2002 class 1. Procedures from IEC 61672-3:2006 were used to perform the periodic tests.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 4.5 - DB: 4.50) by using procedure 2250-L-4950.

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2011-09-08

Date of issue: 2011-09-08

Steen Vodstrup Andersen
Calibration Technician

Nils Johansen
Approved Signatory

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

1. Calibration Note

n/a

2. Summary

4.1. Preliminary inspection	Passed
4.2. Environmental conditions, Prior to calibration	Passed
4.3. Reference information	Passed
4.4. Indication at the calibration check frequency	Passed
4.5. Self-generated noise, Microphone installed	Passed
4.6. Acoustical signal tests of a frequency weighting, C weighting	Passed
4.7. Self-generated noise, Electrical	Passed
4.8. Electrical signal tests of frequency weightings, A weighting	Passed
4.9. Electrical signal tests of frequency weightings, C weighting	Passed
4.10. Electrical signal tests of frequency weightings, Z weighting	Passed
4.11. Frequency and time weightings at 1 kHz	Passed
4.12. Level linearity on the reference level range, Upper	Passed
4.13. Level linearity on the reference level range, Lower	Passed
4.14. Toneburst response, Time-weighting Fast	Passed
4.15. Toneburst response, Time-weighting Slow	Passed
4.16. Toneburst response, LAE	Passed
4.17. Peak C sound level, 8 kHz	Passed
4.18. Peak C sound level, 500 Hz	Passed
4.19. Overload indication	Passed
4.20. Environmental conditions, Following calibration	Passed

The sound level meter submitted for periodic testing successfully completed the class 1 tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.
However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organization responsible pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic test of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

3. Instruments

	Instrument	Inventory No.
Generator	Brüel & Kjær, Type 3560	123560014
AmplifierDivider	Brüel & Kjær, Type 3111	123111004
Calibrator	Brüel & Kjær, Type 4226	124226018
Adaptor	Brüel & Kjær, Type WA-0302-B 15 pF	150503009
Voltmeter	Agilent, Type 34970A	142101028

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

4. Measurements

4.1. Preliminary inspection

Visually inspect instrument, and operate all relevant controls. (section 5)

Routine Passed

4.2. Environmental conditions, Prior to calibration

Actual environmental conditions prior to calibration. (section 7)

	Measured	
	[Deg / kPa / %RH]	
Air temperature	22.30	
Air pressure	99.57	
Relative humidity	53.00	

4.3. Reference information

Information about reference range, level and channel. (section 19.h + 19.m)

	Value	
	[dB]	
Reference sound pressure level	94	
Reference level range	140	
Channel number	1	

4.4. Indication at the calibration check frequency

Measure and adjust sound level meter using the supplied calibrator. (section 9 + 19.m)

	Measured	Uncertainty	
	[dB / Hz]	[dB / Hz]	
Initial indication (supplied calibrator)	93.89	0.14	
Calibration check frequency (supplied calibrator)	1000.00	1.00	
Adjusted indication (supplied calibrator)	93.85	0.14	

4.5. Self-generated noise, Microphone installed

Self-generated noise measured with microphone submitted for periodic testing. Averaging time is 30 seconds. An anechoic chamber is used to isolate environmental noise. (section 10.1)

	Max	Measured	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]
A weighted	17.40	16.16	-1.24	1.00
Monitor Level	20.40	11.40	-9.00	1.00

4.6. Acoustical signal tests of a frequency weighting, C weighting

Frequency weightings measured acoustically with a calibrated multi-frequency sound calibrator. Averaging time is 10 seconds, and the result is the average of 2 measurements. (section 11)

	Coupler Pressure Lc	Mic. Correction C4226	Body Influence	Expected	Measured	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref. (1st)	94.30	0.15	-0.09	94.24	94.18	94.18	-1.1	1.1	-0.06	0.20
1000Hz, Ref. (2nd)	94.30	0.15	-0.09	94.24	94.18	94.18	-1.1	1.1	-0.06	0.20
1000Hz, Ref. (Average)	94.30	0.15	-0.09	94.24	94.18	94.18	-1.1	1.1	-0.06	0.20
125.89Hz (1st)	94.28	0.00	0.00	94.11	94.25	94.25	-1.5	1.5	0.14	0.20
125.89Hz (2nd)	94.28	0.00	0.00	94.11	94.25	94.25	-1.5	1.5	0.14	0.20
125.89Hz (Average)	94.28	0.00	0.00	94.11	94.25	94.25	-1.5	1.5	0.14	0.20
3981.1Hz (1st)	94.23	1.15	-0.06	92.37	92.17	92.17	-1.6	1.6	-0.20	0.30
3981.1Hz (2nd)	94.23	1.15	-0.06	92.37	92.18	92.18	-1.6	1.6	-0.19	0.30
3981.1Hz (Average)	94.23	1.15	-0.06	92.37	92.18	92.18	-1.6	1.6	-0.19	0.30
7943.3Hz (1st)	93.98	3.85	-0.17	87.33	86.98	86.98	-3.1	2.1	-0.35	0.40
7943.3Hz (2nd)	93.98	3.85	-0.17	87.33	86.99	86.99	-3.1	2.1	-0.34	0.40
7943.3Hz (Average)	93.98	3.85	-0.17	87.33	86.98	86.98	-3.1	2.1	-0.35	0.40

4.7. Self-generated noise, Electrical

Self-generated noise measured in most sensitive range, with electrical substitution for microphone, according to manufactures specifications.

Exceedance of the measured level above the corresponding level given in the instruction manual does not, by itself, mean that the performance of the sound level meter is no longer acceptable for many practical applications. (section 10.2)

	Max	Measured	Uncertainty
	[dB]	[dB]	[dB]
A weighted	13.70	12.86	0.30
C weighted	15.00	13.37	0.30
Z weighted	20.40	18.91	0.30

4.8. Electrical signal tests of frequency weightings, A weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (section 12)

	Input Level	Expected	Measured	Acoustical Resp.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-24.68	95.00	95.00	-0.04	-0.09	94.87	-1.1	1.1	-0.13	0.12
63.096Hz	1.52	95.00	95.01	0.21	0.00	95.22	-1.5	1.5	0.22	0.12
125.89Hz	-8.58	95.00	95.01	0.10	0.00	95.11	-1.5	1.5	0.11	0.12
251.19Hz	-16.08	95.00	94.97	0.01	0.06	95.04	-1.4	1.4	0.04	0.12
501.19Hz	-21.48	95.00	94.97	-0.03	0.22	95.16	-1.4	1.4	0.16	0.12
1995.3Hz	-25.88	95.00	95.00	-0.04	-0.01	94.95	-1.6	1.6	-0.05	0.12
3981.1Hz	-25.68	95.00	94.91	-0.02	-0.06	94.83	-1.6	1.6	-0.17	0.12
7943.3Hz	-23.58	95.00	94.69	0.02	-0.17	94.54	-3.1	2.1	-0.46	0.12
15849Hz	-18.08	95.00	95.59	0.06	-0.01	95.64	-17.0	3.5	0.64	0.12

4.9. Electrical signal tests of frequency weightings, C weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (section 12)

	Input Level	Expected	Measured	Acoustical Resp.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-24.68	95.00	95.00	-0.04	-0.09	94.87	-1.1	1.1	-0.13	0.12
63.096Hz	-23.88	95.00	94.97	0.21	0.00	95.18	-1.5	1.5	0.18	0.12
125.89Hz	-24.48	95.00	95.03	0.10	0.00	95.13	-1.5	1.5	0.13	0.12
251.19Hz	-24.68	95.00	95.00	0.01	0.06	95.07	-1.4	1.4	0.07	0.12
501.19Hz	-24.68	95.00	95.04	-0.03	0.22	95.23	-1.4	1.4	0.23	0.12
1995.3Hz	-24.48	95.00	95.03	-0.04	-0.01	94.98	-1.6	1.6	-0.02	0.12
3981.1Hz	-23.88	95.00	94.92	-0.02	-0.06	94.84	-1.6	1.6	-0.16	0.12
7943.3Hz	-21.68	95.00	94.69	0.02	-0.17	94.54	-3.1	2.1	-0.46	0.12
15849Hz	-16.18	95.00	95.56	0.06	-0.01	95.61	-17.0	3.5	0.61	0.12

4.10. Electrical signal tests of frequency weightings, Z weighting

Frequency response measured with electrical signal relative to level at 1 kHz in reference range. (section 12)

	Input Level	Expected	Measured	Acoustical Resp.	Body Influence	Corr. Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dBV]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
1000Hz, Ref.	-24.68	95.00	95.00	-0.04	-0.09	94.87	-1.1	1.1	-0.13	0.12
63.096Hz	-24.68	95.00	94.98	0.21	0.00	95.19	-1.5	1.5	0.19	0.12
125.89Hz	-24.68	95.00	95.00	0.10	0.00	95.10	-1.5	1.5	0.10	0.12
251.19Hz	-24.68	95.00	95.00	0.01	0.06	95.07	-1.4	1.4	0.07	0.12
501.19Hz	-24.68	95.00	95.00	-0.03	0.22	95.19	-1.4	1.4	0.19	0.12
1995.3Hz	-24.68	95.00	95.00	-0.04	-0.01	94.95	-1.6	1.6	-0.05	0.12
3981.1Hz	-24.68	95.00	94.94	-0.02	-0.06	94.86	-1.6	1.6	-0.14	0.12
7943.3Hz	-24.68	95.00	94.70	0.02	-0.17	94.55	-3.1	2.1	-0.45	0.12
15849Hz	-24.68	95.00	95.62	0.06	-0.01	95.67	-17.0	3.5	0.67	0.12

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4.11. Frequency and time weightings at 1 kHz

Frequency and time weighting measured at 1 kHz with electrical signal in reference range. Measured relative to A-weighted and Fast response. (section 13)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
LAF, Ref.	94.00	94.00	-0.4	0.4	0.00	0.12
LCF	94.00	94.00	-0.4	0.4	0.00	0.12
LZF	94.00	94.00	-0.4	0.4	0.00	0.12
LAS	94.00	93.99	-0.4	0.4	-0.01	0.12
LAeq	94.00	93.99	-0.4	0.4	-0.01	0.12

4.12. Level linearity on the reference level range, Upper

Level linearity in reference range, measured at 8 kHz until overload. (section 14)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
94 dB	94.00	94.00	-1.1	1.1	0.00	0.12
99 dB	99.00	99.00	-1.1	1.1	0.00	0.12
104 dB	104.00	104.00	-1.1	1.1	0.00	0.12
109 dB	109.00	109.01	-1.1	1.1	0.01	0.12
114 dB	114.00	114.02	-1.1	1.1	0.02	0.12
119 dB	119.00	119.02	-1.1	1.1	0.02	0.12
124 dB	124.00	124.02	-1.1	1.1	0.02	0.12
129 dB	129.00	129.03	-1.1	1.1	0.03	0.12
134 dB	134.00	134.02	-1.1	1.1	0.02	0.12
135 dB	135.00	135.02	-1.1	1.1	0.02	0.12
136 dB	136.00	136.02	-1.1	1.1	0.02	0.12
137 dB	137.00	137.02	-1.1	1.1	0.02	0.12
138 dB	138.00	138.02	-1.1	1.1	0.02	0.12
139 dB	139.00	139.02	-1.1	1.1	0.02	0.12

4.13. Level linearity on the reference level range, Lower

Level linearity in reference range, measured at 8 kHz down to lower limit, or until underrange. (section 14)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
94 dB	94.00	94.00	-1.1	1.1	0.00	0.12
89 dB	89.00	88.99	-1.1	1.1	-0.01	0.12
84 dB	84.00	84.00	-1.1	1.1	0.00	0.12
79 dB	79.00	78.99	-1.1	1.1	-0.01	0.12
74 dB	74.00	73.99	-1.1	1.1	-0.01	0.12
69 dB	69.00	68.99	-1.1	1.1	-0.01	0.12
64 dB	64.00	63.98	-1.1	1.1	-0.02	0.12
59 dB	59.00	58.98	-1.1	1.1	-0.02	0.12
54 dB	54.00	53.99	-1.1	1.1	-0.01	0.12
49 dB	49.00	48.99	-1.1	1.1	-0.01	0.12
44 dB	44.00	44.00	-1.1	1.1	0.00	0.12
39 dB	39.00	39.02	-1.1	1.1	0.02	0.30
34 dB	34.00	34.04	-1.1	1.1	0.04	0.30
29 dB	29.00	29.11	-1.1	1.1	0.11	0.30
28 dB	28.00	28.17	-1.1	1.1	0.17	0.30
27 dB	27.00	27.19	-1.1	1.1	0.19	0.30
26 dB	26.00	26.24	-1.1	1.1	0.24	0.30
25 dB	25.00	25.29	-1.1	1.1	0.29	0.30

4.14. Toneburst response, Time-weighting Fast

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (section 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	138.00	138.00	-0.8	0.8	0.00	0.11
200 ms Burst	137.00	136.99	-0.8	0.8	-0.01	0.11
2 ms Burst	120.00	119.93	-1.8	1.3	-0.07	0.11
0.25 ms Burst	111.00	110.87	-3.3	1.3	-0.13	0.11

4.15. Toneburst response, Time-weighting Slow

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (section 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	138.00	138.01	-0.8	0.8	0.01	0.11
200 ms Burst	130.61	130.58	-0.8	0.8	-0.03	0.11
2 ms Burst	111.01	110.97	-3.3	1.3	-0.04	0.11

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4.16. Toneburst response, LAE

Response to 4 kHz toneburst measured in reference range, relative to continuous signal. (section 16)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	138.00	138.00	-0.8	0.8	0.00	0.11
200 ms Burst	131.00	130.98	-0.8	0.8	-0.02	0.11
2 ms Burst	111.00	110.96	-1.8	1.3	-0.04	0.11
0.25 ms Burst	102.00	101.86	-3.3	1.3	-0.14	0.11

4.17. Peak C sound level, 8 kHz

Peak-response to a 8 kHz single- cycle sine measured in least-sensitive range, relative to continuous signal. (section 17)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	135.00	135.00	-0.4	0.4	0.00	0.11
Single Sine	138.40	138.64	-2.4	2.4	0.24	0.40

4.18. Peak C sound level, 500 Hz

Peak-response to a 500 Hz half-cycle sine measured in least-sensitive range, relative to continuous signal. (section 17)

	Expected	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
Continuous, Ref.	135.00	135.00	-0.4	0.4	0.00	0.11
Half-sine, Positive	137.40	137.11	-1.4	1.4	-0.29	0.40
Half-sine, Negative	137.40	137.11	-1.4	1.4	-0.29	0.40

4.19. Overload indication

Overload indication in the least sensitive range determined with a 4 kHz positive/negative half-cycle signal. (section 18)

	Measured	Accept - Limit	Accept + Limit	Deviation	Uncertainty
	[dB]	[dB]	[dB]	[dB]	[dB]
Continuous	140.00	-0.4	0.4	0.00	0.20
Half-sine, Positive	141.10	-10.0	10.0	1.10	0.20
Half-sine, Negative	141.20	-10.0	10.0	1.20	0.20
Difference	141.20	-1.8	1.8	0.10	0.30

4.20. Environmental conditions, Following calibration

Actual environmental conditions following calibration. (section 7)

	Measured
	[Deg / kPa / %RH]
Air temperature	22.90
Air pressure	99.50
Relative humidity	51.00

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DANAK

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- *that the laboratory and its personnel are free from any commercial, financial or other pressures, which might influence their impartiality;*
- *that the laboratory operates a documented management system, and has a management that ensures that the system is followed and maintained;*
- *that the laboratory has at its disposal all items of equipment, facilities and premises required for correct performance of the service that it is accredited to perform;*
- *that the laboratory has at its disposal personnel with technical competence and practical experience in performing the services that they are accredited to perform;*
- *that the laboratory has procedures for traceability and uncertainty calculations;*
- *that accredited testing, calibration or medical examination are performed in accordance with fully validated and documented methods;*
- *that accredited services are performed and reported in confidentiality with the customer and in compliance with the customer's request;*
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