



Technical Appendix 9.1 – 9.6

Noise

Knockanarragh Wind Farm – EIA Volume 3

Knockanarragh Wind Farm Limited

SLR Project No.: 501.00727.00088

19 March 2024

A.1 Appendix 9.1 – Glossary

Table A.1 Glossary of Terms

Terminology	Description
A-weighting	a filter that weights individual frequencies of sound to better represent the frequency response of the human ear when assessing the likely effects of noise on humans
acoustic character	one or more distinctive features of a sound (e.g., tones, whines, whistles, impulses) that set it apart from the background noise against which it is being judged, possibly leading to a greater subjective effect than the level of the sound alone might suggest
ambient noise	All-encompassing noise associated with a given environment, usually a composite of sounds from many sources both far and near, often with no particular sound being dominant
attenuation	the reduction in level of a sound between the source and a receiver due to any combination of effects including distance, atmospheric absorption, acoustic screening, the presence of a building façade, etc.
background noise	the noise level rarely fallen below in any given location over any given time period. The L_{A90} indices is often used to represent the background noise level.
daytime hours	07.00 to 23.00 any day of the week. Different to the quiet daytime hours
dB	abbreviation for 'decibel'
dB(A)	abbreviation for the decibel level of a sound that has been A-weighted
decibel	the unit normally employed to measure the magnitude of sound
directivity	the property of a sound source that causes more sound to be radiated in one direction than another
equivalent continuous sound pressure level	the steady sound level which has the same energy as a time varying sound signal when averaged over the same time interval, T, denoted by $L_{Aeq,T}$
frequency	the number of acoustic pressure fluctuations per second occurring about the atmospheric mean pressure (also known as the 'pitch' of a sound)
ground effects	the modification of sound at a receiver location due to the interaction of the sound wave with the ground along its propagation path from source to receiver. Described using the term 'G', and ranges between 0 (hard), 0.5 (mixed) and 1 (soft).
Hertz (Hz)	the unit used to measure the frequency of a sound, equal to cycles per second of acoustic pressure fluctuations about the atmospheric mean pressure
L_{Aeq}	the abbreviation of the A-weighted equivalent continuous sound pressure level
L_{A10}	the abbreviation of the 10-percentile exceeded sound level, often used for the measurement of road traffic noise
L_{A90}	the abbreviation of the 90-percentile exceeded sound level, often used for the measurement of background noise
noise	physically: a regular and ordered oscillation of air molecules that travels away from the source of vibration and creates fluctuating positive and negative acoustic pressure above and below atmospheric pressure. Subjectively: sound that evokes a feeling of displeasure in the environment in which it is heard, and is therefore unwelcomed by the receiver



Terminology	Description
noise emission	the noise emitted by a source of sound
noise immission	the sound pressure level at a receiver
night-time hours	defined by ETSU-R-97 as the hours between 23.00 and 07.00, any day
percentile exceeded sound level	the noise level exceeded for n% of the time over a given time period, T, denoted by $L_{An,T}$
quiet daytime hours	defined by ETSU-R-97 as the hours between 18.00 and 23.00 Monday to Friday, 13.00 and 23.00 Saturdays and 07.00 and 23.00 Sundays
receiver	a person or property exposed to the noise being considered
respite	a period of reduced wind turbine noise immission level occurring during certain wind conditions
sound	physically: a regular and ordered oscillation of air molecules that travels away from the source of vibration and creates fluctuating positive and negative acoustic pressure above and below atmospheric pressure subjectively: the sensation of hearing excited by the acoustic oscillations described above (see also 'noise')
sound level meter	an instrument for measuring sound pressure level
sound power level	the total sound power radiated by a source, in decibels
sound pressure level	a measure of the sound pressure at a point, in decibels
spectrum	a description of the amplitude of a sound as a function of frequency
standardised wind speed	values of wind speed at hub height corrected to a standardised height of ten metres using the same procedure as used in wind turbine emission testing
tone	the concentration of acoustic energy into a very narrow frequency range
wind shear	the change in wind speed with height above ground



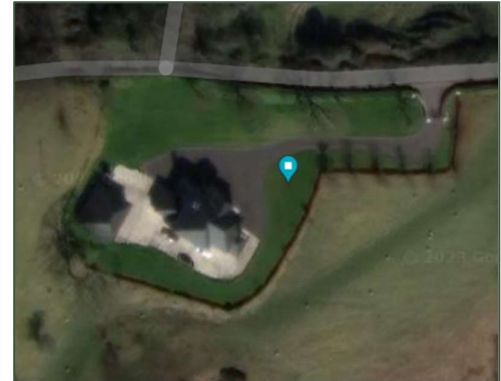
A.2 Appendix 9.2 – BASELINE SURVEY DETAILS

A.2.1 NML1 – Killacroy, Co. Meath C15 D2W0

Sound level meter position: 53°39'45.8"N 7°03'31.5"W

Equipment used at measurement location

Equipment	Description	Serial Number	Calibrated
Sound level meter	Rion NL-52	00710362	05/10/2021
Pre-amplifier	Rion NH-25	10904	05/10/2021
Microphone	Rion UC-59	19636	05/10/2021
Calibrator	Rion NC-75	34713324	05/10/2021



- Field calibration value at the start of survey: 94.0 dB @ 1kHz
- Field calibration value at the end of survey: 93.9 dB @ 1kHz
- Drift in field calibration = 0.1 dB

Description of measurement location

Situated to the north west of the proposed turbines and considered representative of dwellings nearby in the north western region.

Rural location with a noise climate that can be described as typical for rural amenity with some traffic audible on the local road, and farming activities audible, farm animals and dogs barking, natural noises such as birds singing when other noise sources abated.

The sound level meter was set up in the front garden, away from the road and the hedges. No localised sources of constant noise.

Photographs of the sound level meter at this location are provided in Plate 9-1 to Plate 9-4.

Details of any excluded data

- Any data measured during, or within 30 minutes of rainfall; and
- Data showing a temporary increase in noise clearly not related to wind speed:
 - Saturday 8/10/22 11:50 to 12:00 (UTC)
 - Saturday 8/10/22 13:50 to 15:30 (UTC)



Plate 9-1: NML1 sound level meter looking north



Plate 9-2: NML1 sound level meter looking south



Plate 9-3: NML1 sound level meter looking east



Plate 9-4: NML1 sound level meter looking west

A.2.2 NML2 – Newtown, Co. Westmeath. C15 WF29

Sound level meter position: 53°38'42.3"N 7°02'16.5"W

Equipment used at measurement location

Equipment	Description	Serial Number	Calibrated
Sound level meter	LD-LxT1L	0005978	30/08/22
Pre-amplifier	Larson Davis	070009	30/08/22
Microphone	PCB	425452	30/08/22
Calibrator	Larson Davis	9175	30/08/22

- Field calibration value at the start of survey: 114.0 dB @ 250Hz
- Field calibration value at the end of survey: 114.0 dB @ 250Hz
- Drift in field calibration = 0.0 dB



Description of measurement location

Situated to the east of the proposed turbines, off the N52. This location is considered representative of dwellings near to the section of the N52 south of Clonmellon.

Rural location with a noise climate that can be described as typical for rural amenity with some traffic audible on the local road, and farming activities audible, farm animals and dogs barking, natural noises such as birds singing when other noise sources abated.

The sound level meter was set up in the side garden of the property, away from the road and the hedges. No localised sources of constant noise as the boiler is located behind the house and not in regular use currently. The property doesn't have any equipment that is constantly running.

Photographs of the sound level meter at this location are provided in Plate 9-5 to Plate 9-8.

Details of any excluded data

- Any data measured during, or within 30 minutes of rainfall; and
- Data showing a temporary increase in noise clearly not related to wind speed:
 - Saturday 1/10/22 14:50 to 15:30 (UTC)





Plate 9-5: NML2 sound level meter looking north



Plate 9-6: NML2 sound level meter looking south



Plate 9-7: NML2 sound level meter looking east



Plate 9-8: NML2 sound level meter looking west

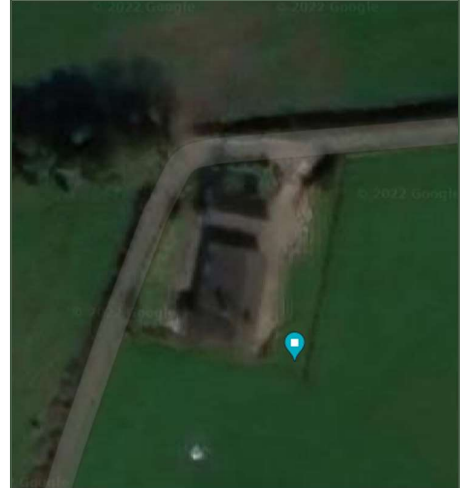
A.2.3 MNL3 – Rosmead, Co. Westmeath R32 R2R2

Sound level meter position: 53°38'49.9"N 7°02'53.7"W

Equipment used at measurement location

Equipment	Description	Serial Number	Calibrated
Sound level meter	LD-LxT1L	0006602	30/08/22
Pre-amplifier	Larson Davis	042683	30/08/22
Microphone	PCB	168567	30/08/22
Calibrator	Larson Davis	9175	30/08/22

- Field calibration value at the start of survey: 114.0 dB @ 250Hz
- Field calibration value at the end of survey: 114.0 dB @ 250Hz
- Drift in field calibration = 0.0 dB



Description of measurement location

Situated in between the two groups of proposed turbines, off the L5542. This location is considered representative of dwellings near the central region and those situated north west of the southern turbine cluster.

Noise climate can be described as rural amenity with natural noises such as birds and wind disturbed vegetation, distant and passing road traffic noise could be heard. Resident at this location park their vehicles at the back of the house approximately 15m away from the sound level meter. All data was inspected and excluded where vehicle noise was evident.

The sound level meter was set up in the side garden, away from the road and the hedges. No localised sources of constant noise as the boiler is located behind the house and not in regular use currently. The farm doesn't have any equipment that is constantly running.

Photographs of the sound level meter at this location are provided in Plate 9-9 to Plate 9-12.

Details of any excluded data

- Any data measured during, or within 30 minutes of rainfall; and
- Data showing a temporary increase in noise clearly not related to wind speed:
 - Friday 16/09/22 18:50 to 19:10 (UTC)
 - Sunday 18/09/22 07:20 to 07:40 and 13:20 to 14:10 (UTC)
 - Sunday 25/09/22 08:00 to 08:30 (UTC)
 - Monday 10/10/22 17:10 to 19:30 (UTC)
 - Wednesday 12/10/22 18:20 to 23:10 (UTC)



Plate 9-9: NML3 sound level meter looking north



Plate 9-10: NML3 sound level meter looking south



Plate 9-11: NML3 sound level meter looking east



Plate 9-12: NML3 sound level meter looking west

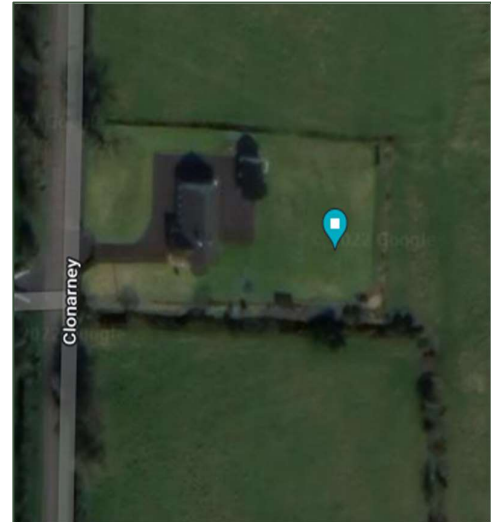
A.2.4 NML4 – Clonarney. N91 CK46

Sound level meter position: 53°38'00.1"N 7°04'27.8"W

Equipment used at measurement location

Equipment	Description	Serial Number	Calibrated
Sound level meter	LD-LxT SE	0006600	28/09/21
Pre-amplifier	Larson Davis		28/09/21
Microphone	PCB		28/09/21
Calibrator	Larson Davis	9175	30/08/22

- Field calibration value at the start of survey: 114.0 dB @ 250Hz
- Field calibration value at the end of survey: 113.9 dB @ 250Hz
- Drift in field calibration = 0.1 dB



Description of measurement location

Situated to the west of the southern cluster of proposed turbines, off the L1532. This location is considered representative of dwellings in the area off the same road.

The sound level meter was set up in the rear garden of the property approximately 20 m from the back of the property. There were no localised sources of constant noise, position was on the open lawn.

Noise climate can be described as rural amenity with natural noises such as birds and wind disturbed vegetation, distant and passing road traffic noise could be heard.

A rain gauge was installed at this location. This instrument uses tipping bucket with magnetic switch technology and measures a minimum rain volume of 0.20 mm.

Photographs of the sound level meter at this location are provided in Plate 9-13 to Plate 9-16.

Details of any excluded data

- Every day between 18:10 and 18:50 (UTC) as a regular spike in noise noted
- Any data measured during, or within 30 minutes of rainfall; and
- Data showing a temporary increase in noise clearly not related to wind speed





Plate 9-13: NML4 sound level meter looking north



Plate 9-14: NML4 sound level meter looking south



Plate 9-15: NML4 sound level meter looking east



Plate 9-16: NML4 sound level meter looking west

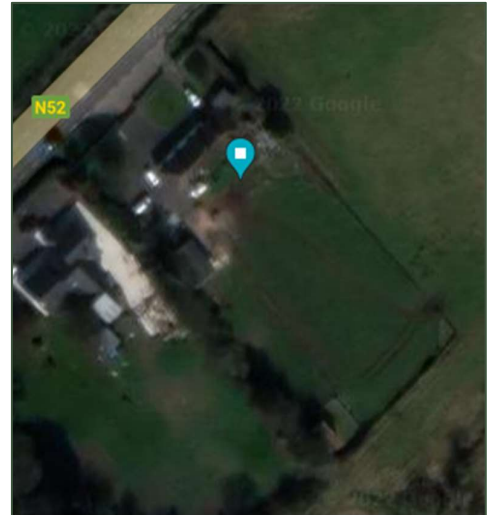
A.2.5 NML5 – Robinstown Great, Co. Westmeath N91 K763

Sound level meter position: 53°37'31.7"N 7°04'25.3"W

Equipment used at measurement location

Equipment	Description	Serial Number	Calibrated
Sound level meter	LD-LxT1L	0006263	30/08/22
Pre-amplifier	Larson Davis	042643	30/08/22
Microphone	PCB	313723	30/08/22
Calibrator	Larson Davis	9175	30/08/22

- Field calibration value at the start of survey: 114.0 dB @ 250Hz
- Field calibration value at the end of survey: 114.0 dB @ 250Hz
- Drift in field calibration = 0.0 dB



Description of measurement location

Situated to the south west of the proposed turbines, off the N52 north of Delvin. This location is considered representative of dwellings nearby off the section of the N52 north of Delvin.

The noise climate at this location was influenced by nearby national secondary road N52 traffic noise and natural sources such as vegetation, birds and cattle.

The sound level meter was installed in the rear garden in open space away from any sources of constant noise or mature vegetation.

Photographs of the sound level meter at this location are provided in Plate 9-17 to Plate 9-20.

Details of any excluded data

- Any data measured during, or within 30 minutes of rainfall; and
- Data showing a temporary increase in noise clearly not related to wind speed





Plate 9-17: NML5 sound level meter looking north



Plate 9-18: NML5 sound level meter looking south



Plate 9-19: NML5 sound level meter looking east



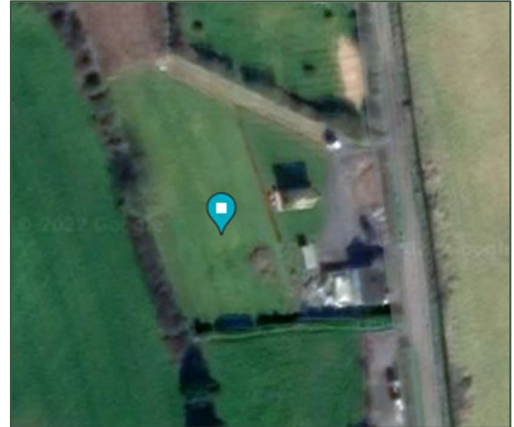
Plate 9-20: NML5 sound level meter looking west

A.2.6 NML6 – Crowenstown, Co. Westmeath N91 F721

Sound level meter position: 53°38'03.2"N 7°02'13.1"W

Equipment used at measurement location

Equipment	Description	Serial Number	Calibrated
Sound level meter	Rion NL-52	00710359	05/10/2021
Pre-amplifier	Rion NH-25	10901	05/10/2021
Microphone	Rion UC-59	19633	05/10/2021
Calibrator	Rion NC-75	34713324	05/10/2021



- Field calibration value at the start of survey: 93.6 dB @ 1kHz
- Field calibration value at the end of survey: 93.8 dB @ 1kHz
- Drift in field calibration = 0.2 dB

Description of measurement location

Situated to the south east of the proposed turbines, off the L5525. This location is considered to be representative of dwellings to the south east of the proposed development.

Rural location with a noise climate that can be described as typical for rural amenity with some traffic audible on the local road, and farming activities audible, farm animals and dogs barking, natural noises such as birds singing when other noise sources abated.

The sound level meter was set up in the rear garden of the property approximately 8 m from the side of a building and the hedgerow. There were no localised sources of constant noise, position was on the open lawn. Residents were also in the process of constructing an outhouse as can be seen in Plate 9-23. Any extraneous noise was excluded.

Photos of the sound level meter at this location are provided in Plate 9-21 to Plate 9-24.

Details of any excluded data

- Any data measured during, or within 30 minutes of rainfall; and
- Data showing a temporary increase in noise clearly not related to wind speed:
 - Wednesday 21/09/22 16:50 to 18:00 (UTC)
 - Wednesday 28/09/22 16:50 to 18:10 (UTC)
 - Thursday 29/09/22 16:50 to 17.50 (UTC)
 - Friday 30/09/22 16:50 to 18:00 (UTC)
 - Saturday 1/10/22 11:50 to 18:00 (UTC)
 - Sunday 2/10/22 13.10 to 14.20 (UTC)
 - Thursday 6/10/22 16:50 to 18.30 (UTC)
 - Friday 7/10/22 17:50 to 18.50 (UTC)
 - Saturday 8/10/22 15.30 to 16:00 (UTC)
 - Monday 10/10/22 16:50 to 18.10 (UTC)
 - Tuesday 11/10/22 17:20 to 18:00 (UTC)



Plate 9-21: NML6 sound level meter looking north



Plate 9-22: NML6 sound level meter looking south



Plate 9-23: NML6 sound level meter looking east



Plate 9-24: NML6 sound level meter looking west

A.3 Appendix 9.3 – MEASURED BACKGROUND NOISE GRAPHS

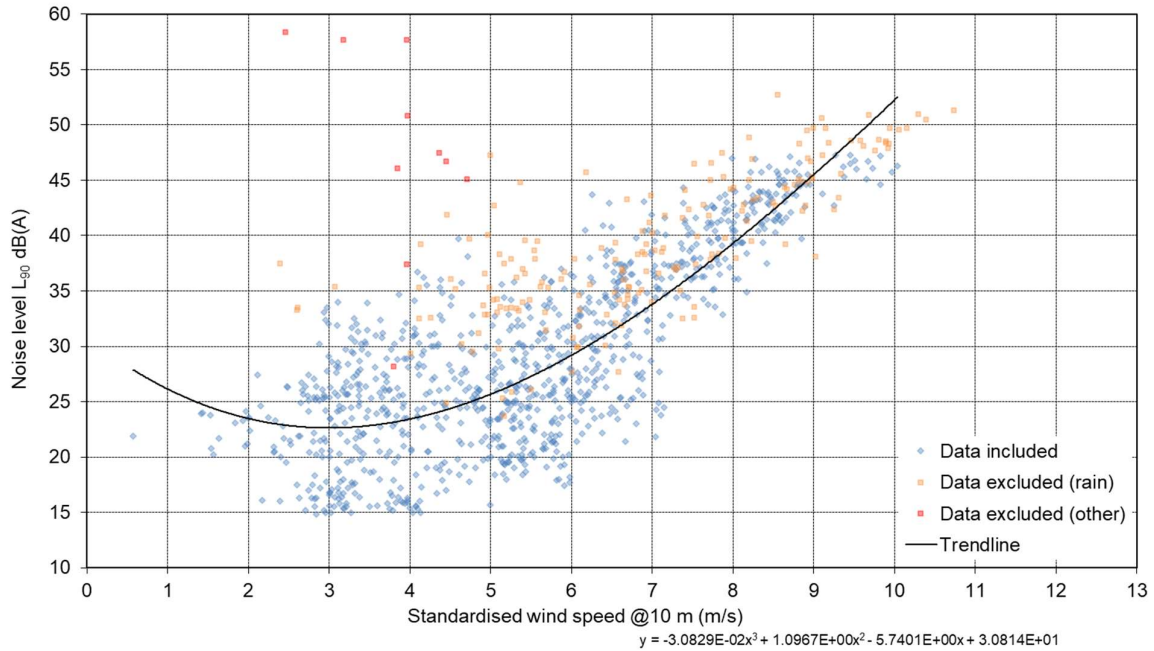


Figure 9-1: Background Noise Measured at NML1 during the Quiet Daytime

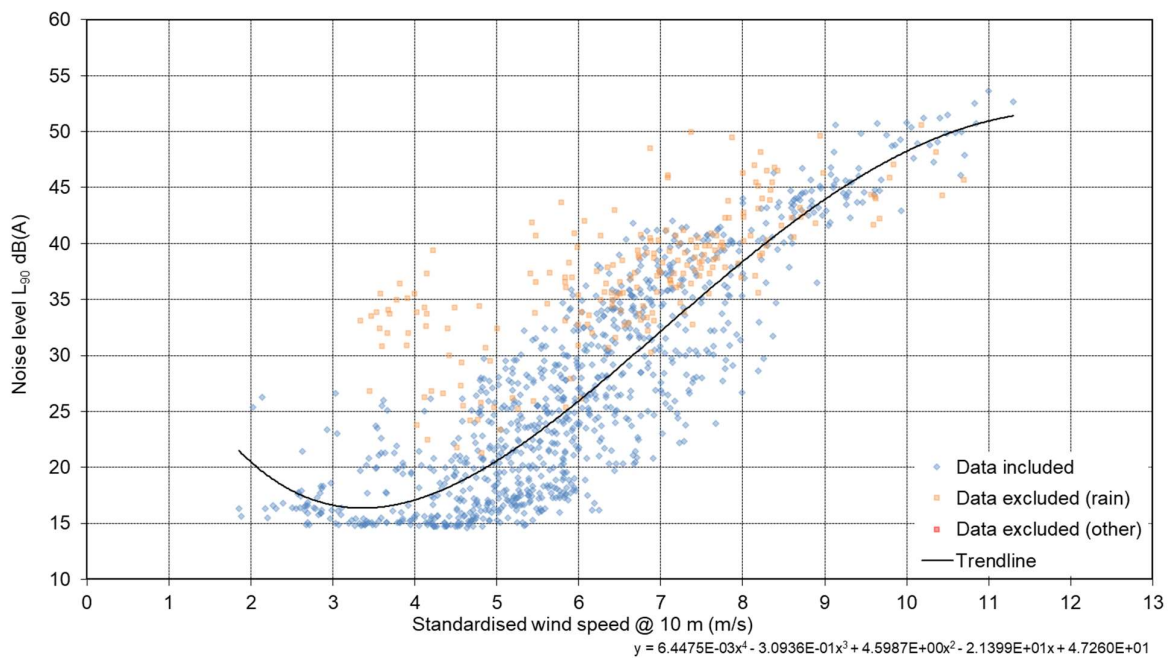


Figure 9-2: Background Noise Measured at NML1 during the Night-time

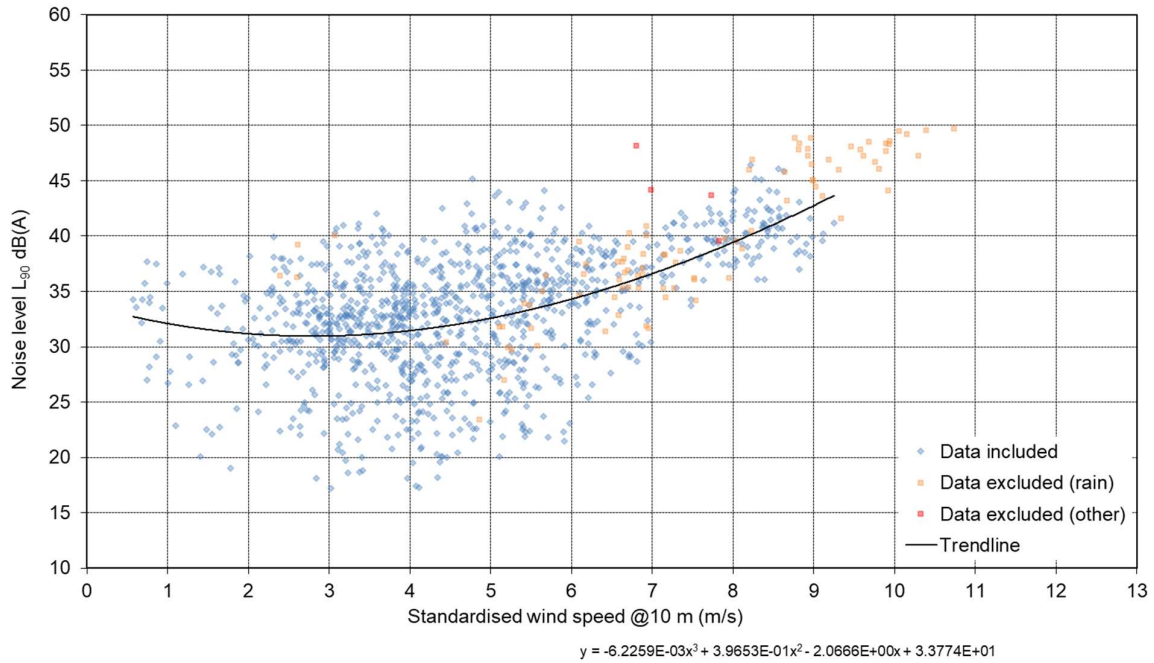


Figure 9-3: Background Noise Measured at NML2 during the Quiet Daytime

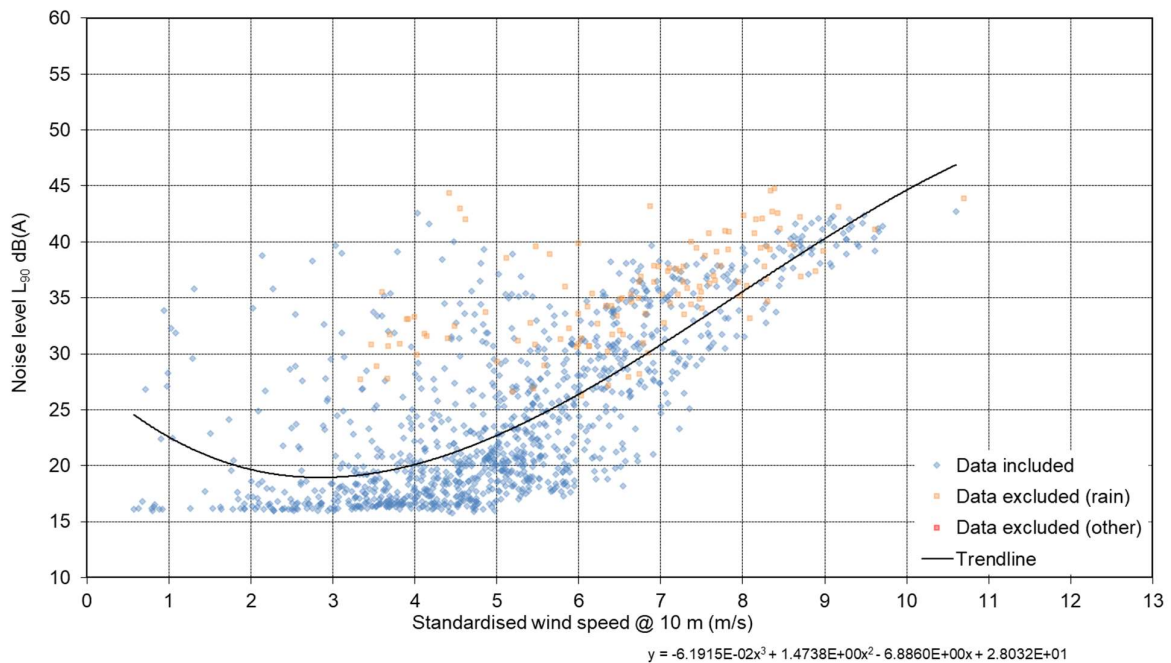


Figure 9-4: Background Noise Measured at NML2 during the Night-time

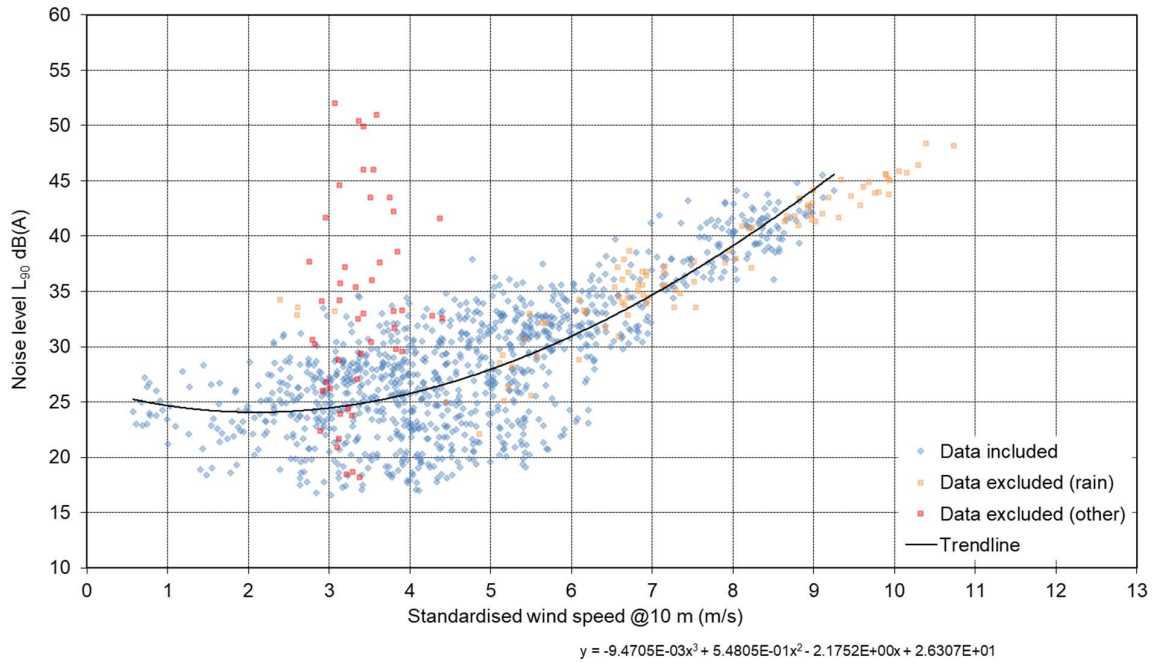


Figure 9-5: Background Noise Measured at NML3 during the Quiet Daytime

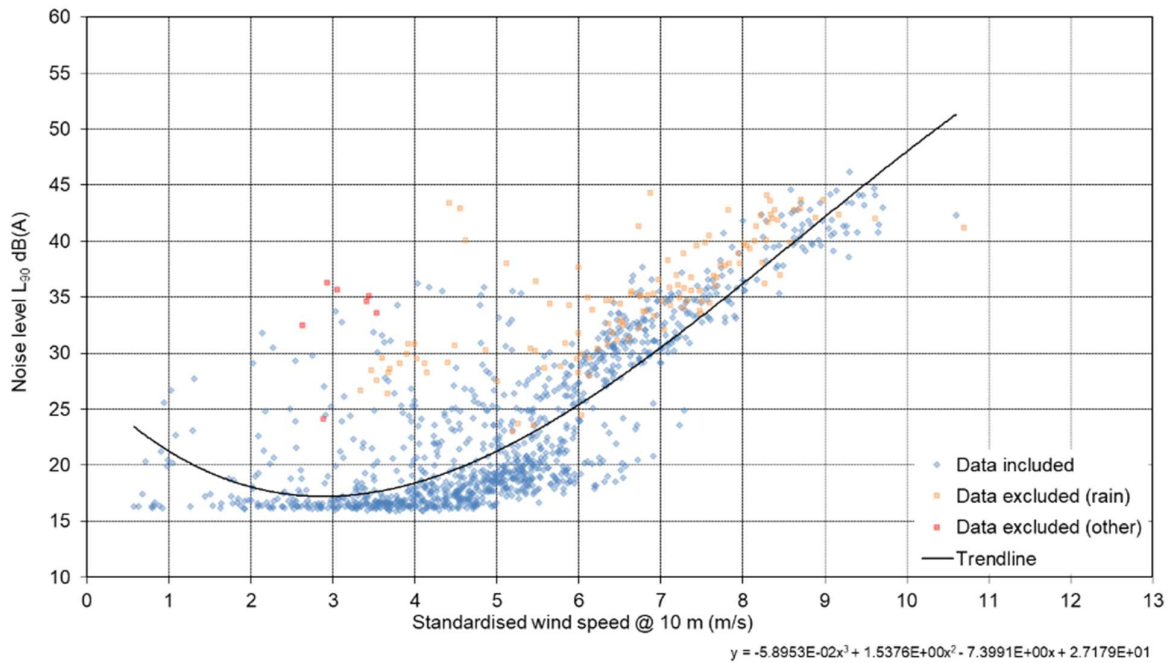


Figure 9-6: Background Noise Measured at NML3 during the Night-time

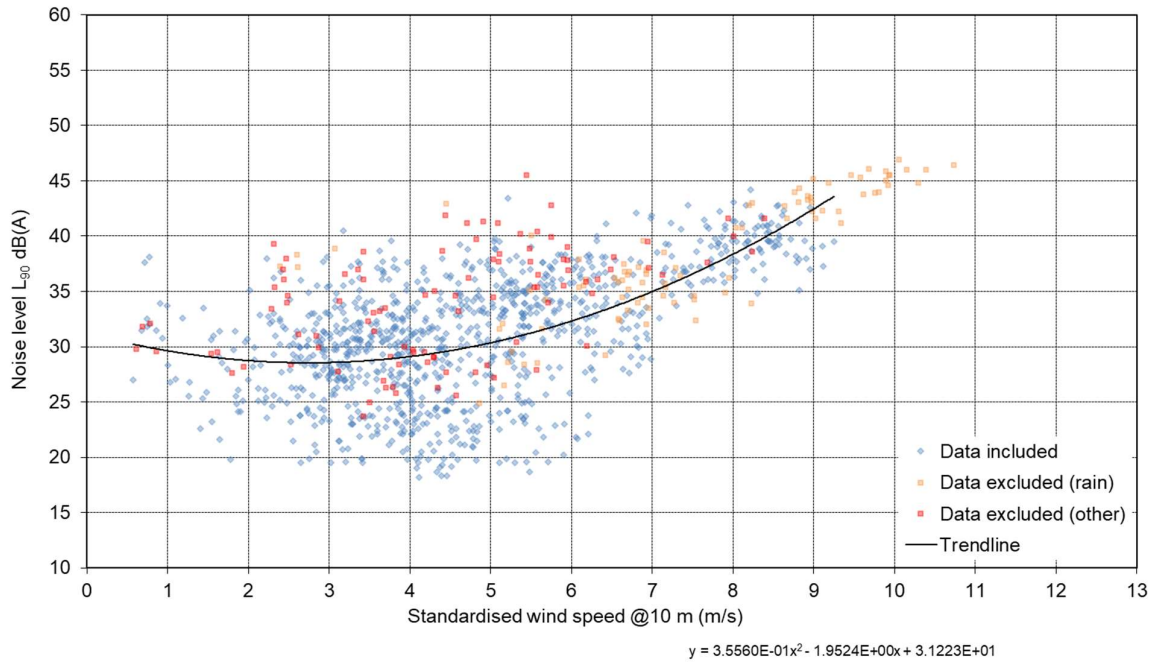


Figure 9-7: Background Noise Measured at NML4 during the Quiet Daytime

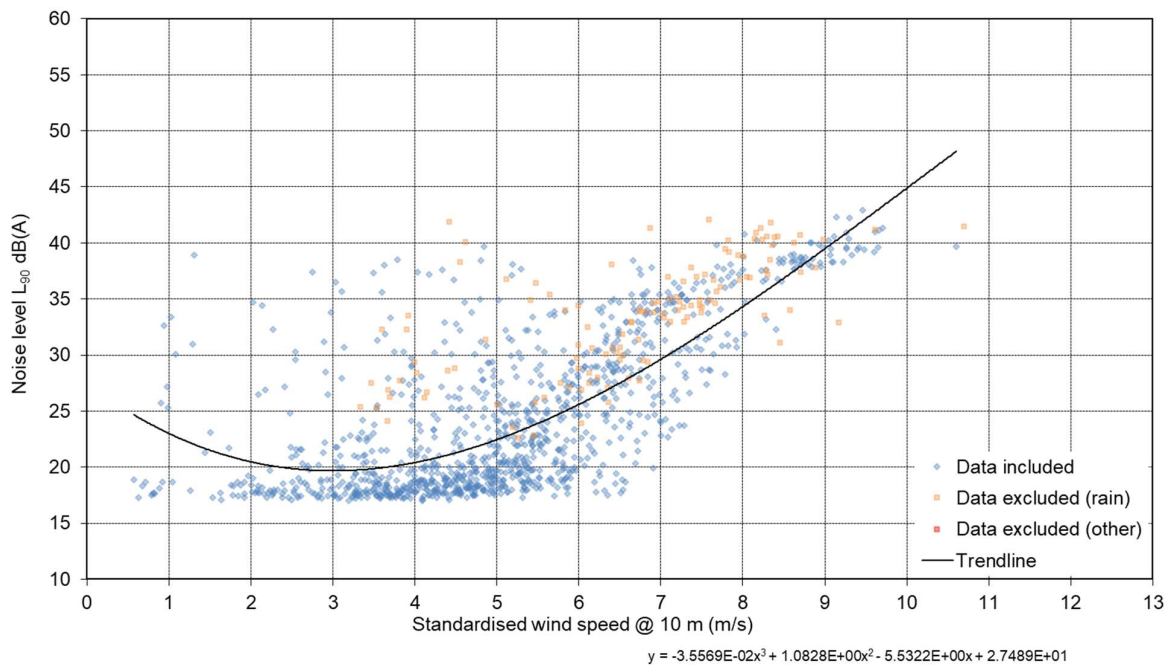


Figure 9-8: Background Noise Measured at NML4 during the Night-time

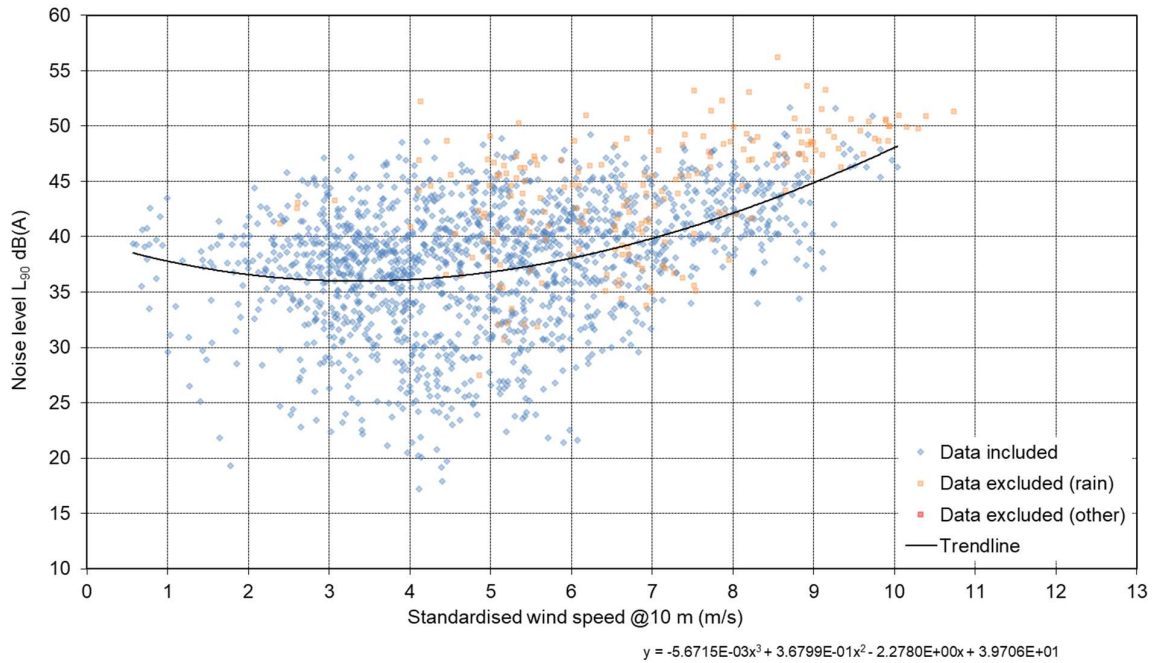


Figure 9-9: Background Noise Measured at NML5 during the Quiet Daytime

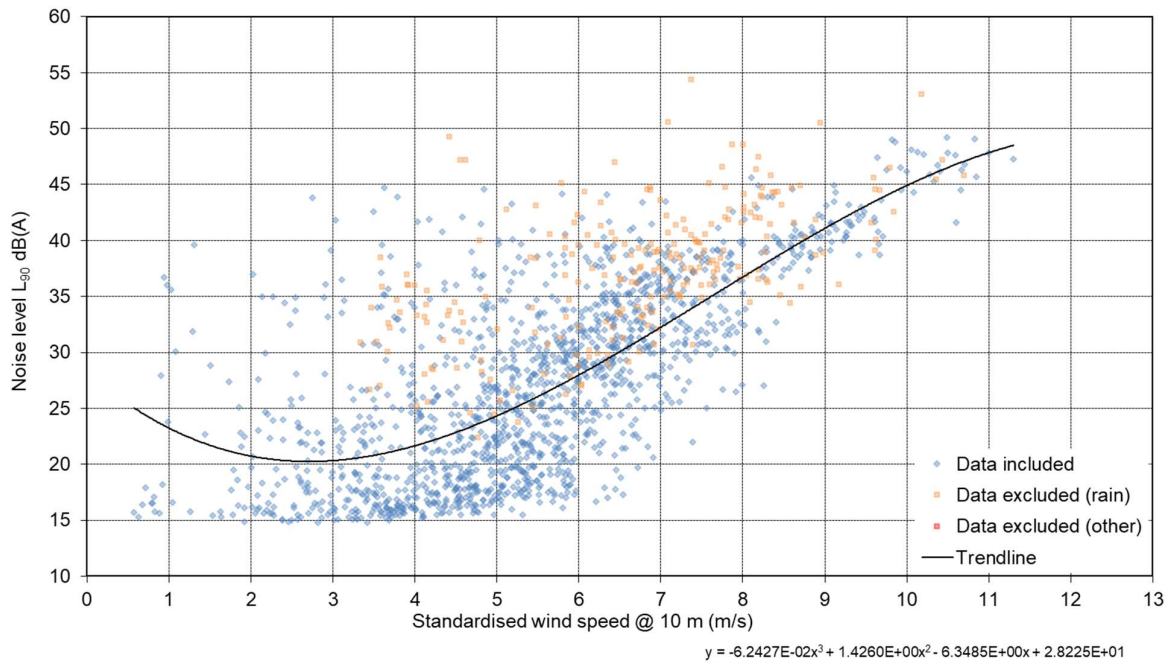


Figure 9-10: Background Noise Measured at NML5 during the Night-time

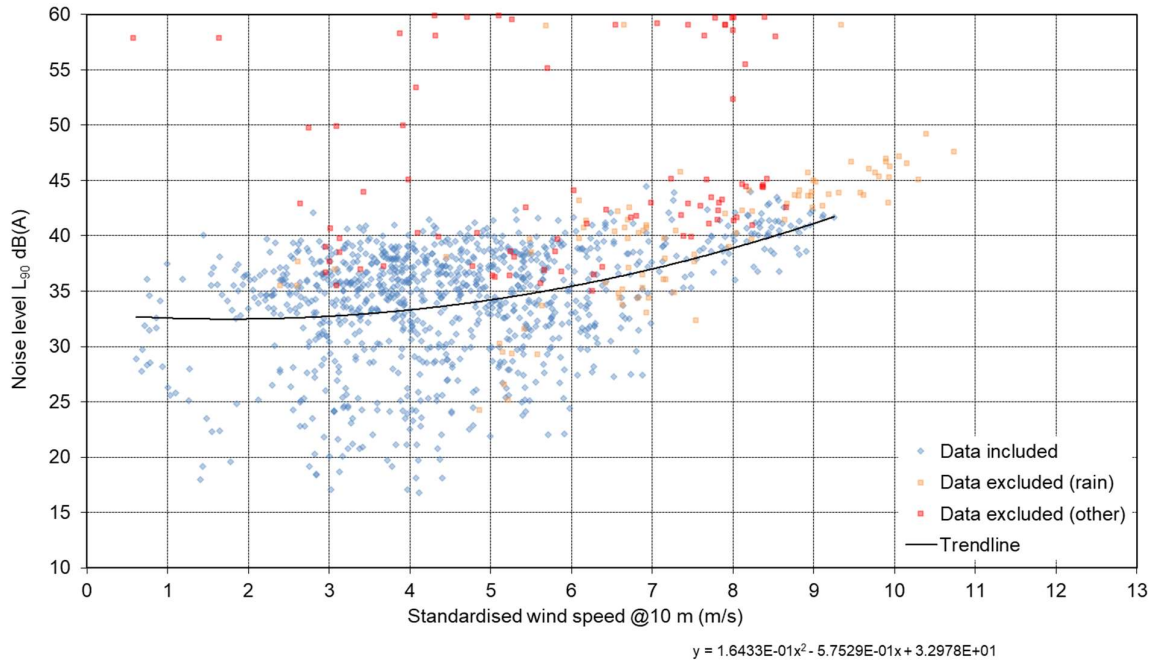


Figure 9-11: Background Noise Measured at NML6 during the Quiet Daytime

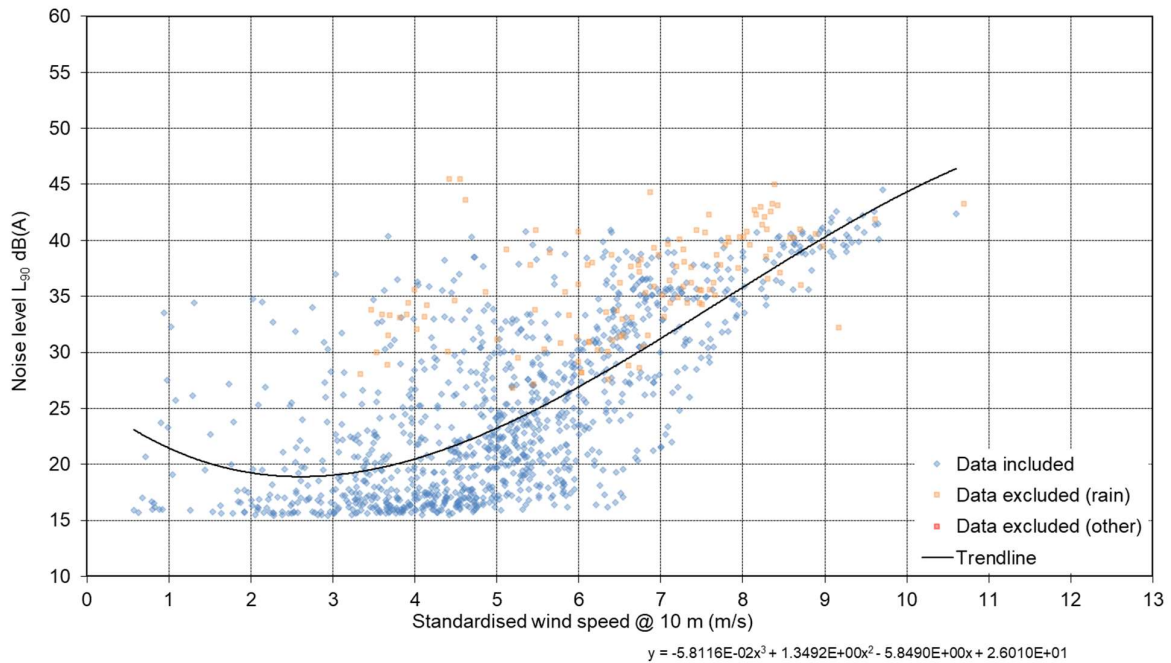


Figure 9-12: Background Noise Measured at NML6 during the Night-time

A.4 Appendix 9.4 – WIND FARM NOISE LIMITS

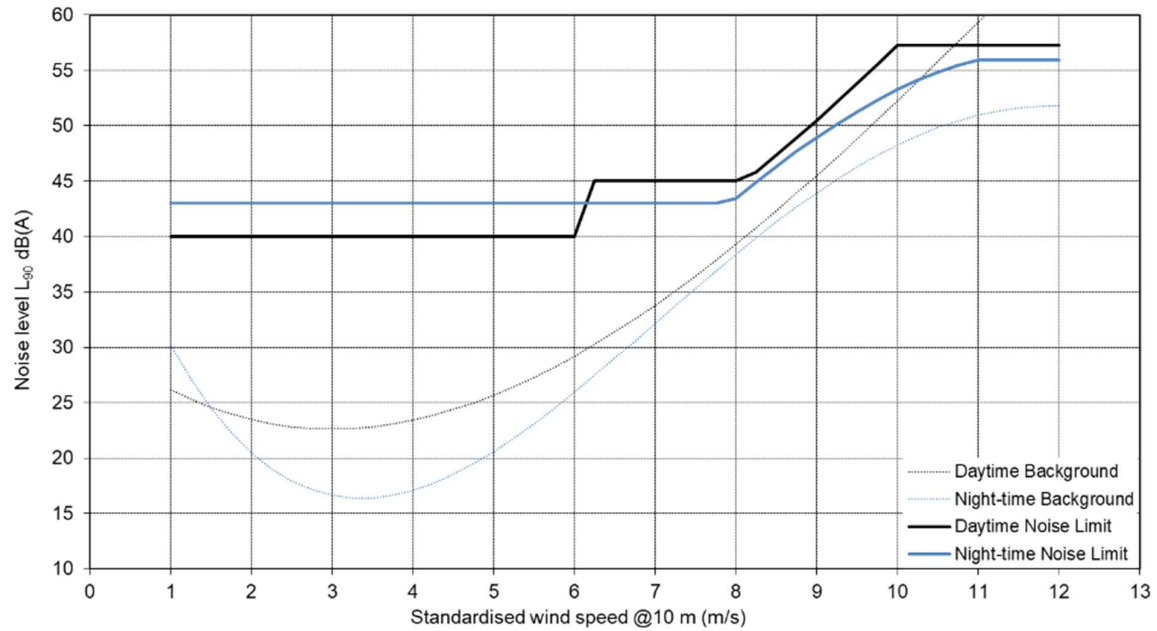


Figure 9-13: Noise Limit at NML1

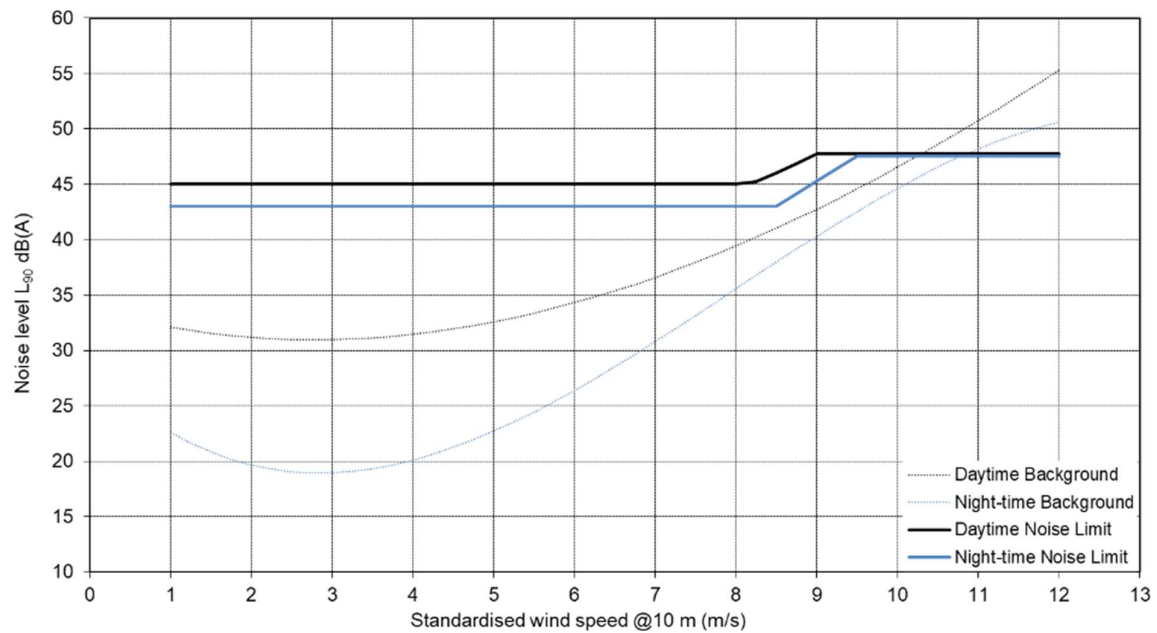


Figure 9-14: Noise Limit at NML2

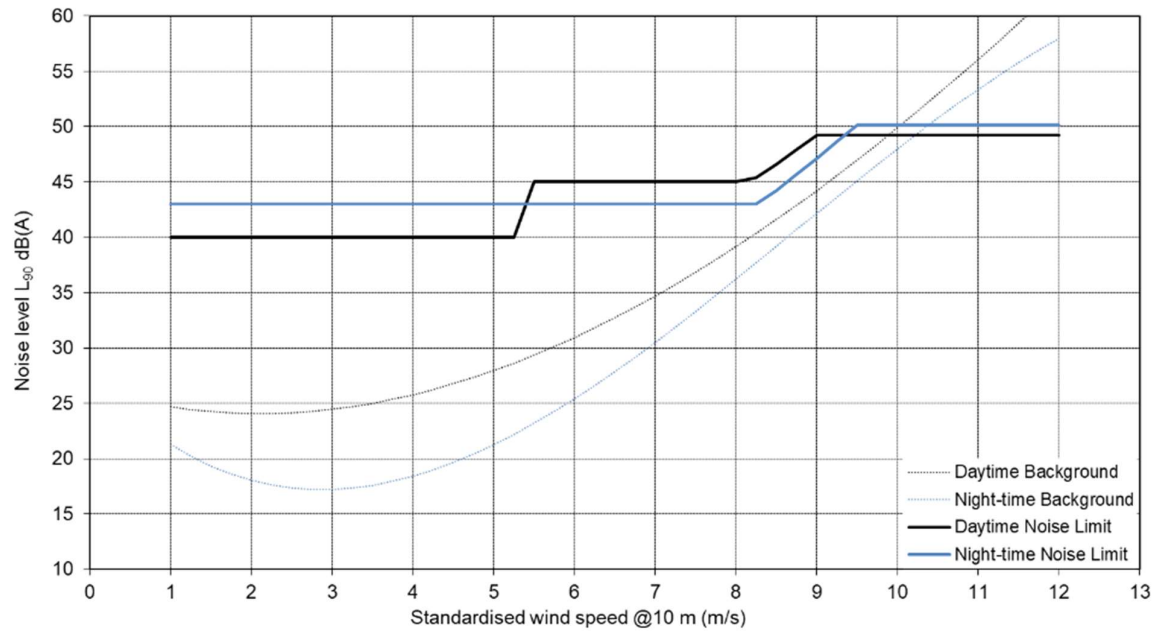


Figure 9-15: Noise Limit at NML3

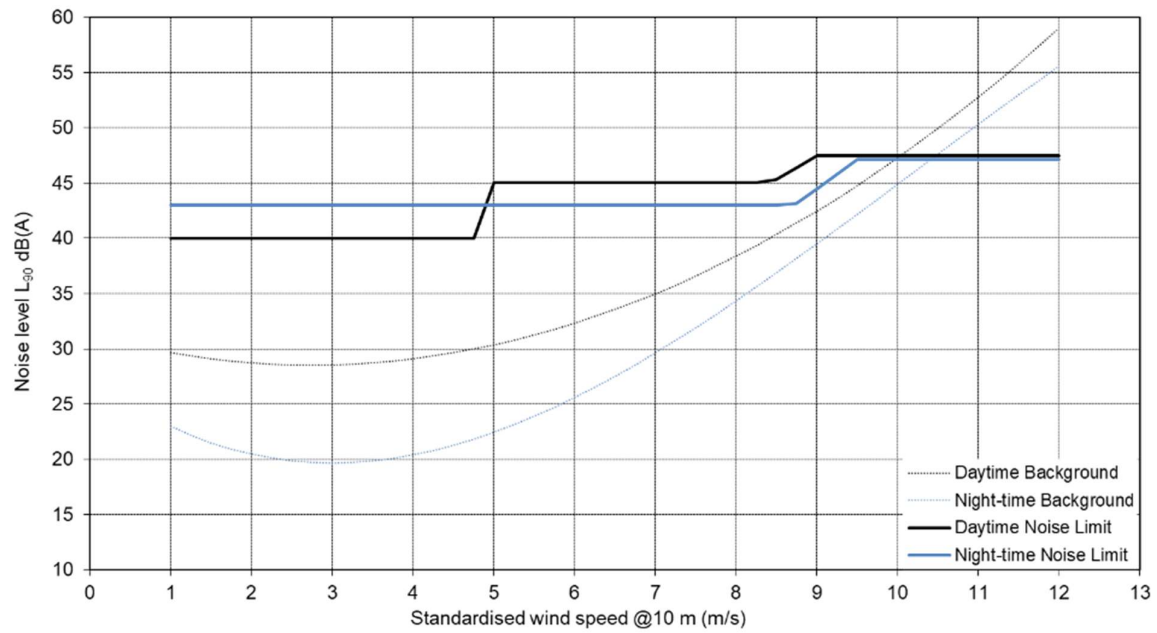


Figure 9-16: Noise Limit at NML4

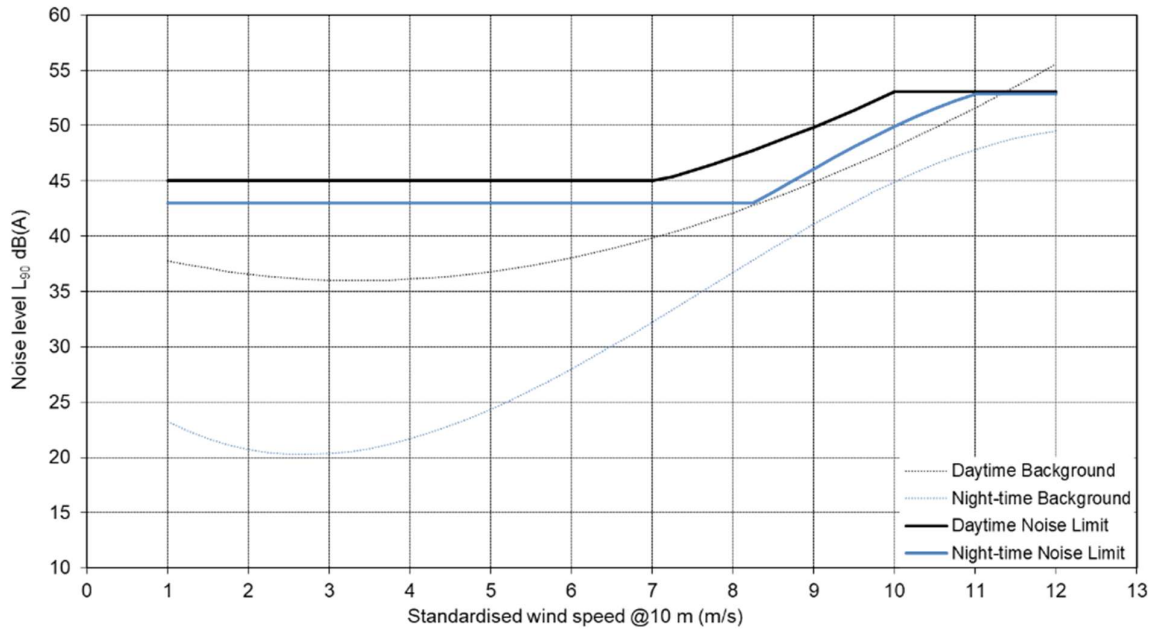


Figure 9-17: Noise Limit at NML5

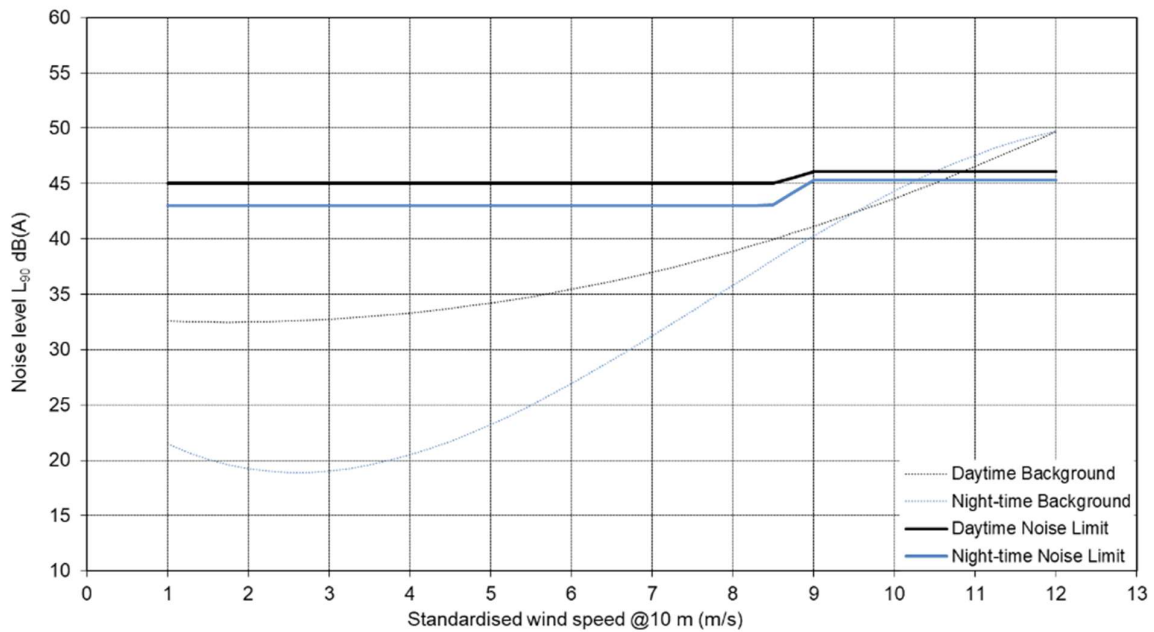


Figure 9-18: Noise Limit at NML6

A.5 Appendix 10.5 – WIND SPEED CALCULATIONS

The IOA GPG¹ requires that noise data recorded every 10 minutes are related to standardised ten metre wind speeds experienced at the hub height of the turbines, at a location on the wind farm representative of the wind farm. These wind speeds can be either measured directly at the turbine hub height or derived by calculation from measurements at two heights, with measurements at the upper height not less than 60% of the turbine hub height and measurements at least 15 metres below that. These are referred to as ‘Method A’ or ‘Method B’ in the IOA GPG which describes these as the preferred methods to use. IOA GPG Supplementary Guidance Note SGN4 provides additional guidance on these methods.

The site of the proposed development has a temporary LiDAR remote sensing measuring system installed which measured wind conditions at various heights as follows:

38m,
69m,
89m,
101m,
109m,
121m, and
164m

The nearest measurement heights to the proposed hub heights of 97.5m and 99m are 89m and 101m. Data captured at these heights were interpolated to a height of 98m as representative of hub height wind speeds during each 10 minute period.

Wind speeds are standardised to a height of ten metres assuming a reference ground roughness length of 0.05 metres as described in the IOA GPG SGN4, Equation 1, reproduced below. This approach is of the same form as that given in BS EN 61400 11:2003 for calculating ten metre wind speeds related to hub height wind speeds when providing source noise emission data for wind turbines.

$$v_{10} = v_{hh} \times \left(\frac{\ln\left[\frac{10}{z_0}\right]}{\ln\left[\frac{h_{hub}}{z_0}\right]} \right)$$

By using this method, measured background noise levels were correlated to ten metre wind speeds calculated from wind speeds at hub height. Any likely difference in the shear profile during the 24 hours of the day will be accounted for within the method and be reflected in the resulting standardised ten metre wind speed data. The method used to calculate ten metre wind speeds from those at hub height is the same as that used when deriving noise emission data for the turbines. Because the same method has been used, direct comparison of background noise levels, noise limits and predicted turbine noise immission levels may be undertaken. This method is consistent with guidance published in the IOA GPG.

¹ A Good Practice Guide to the Application of ETSU R 97 for the Assessment and Rating of Wind Turbine Noise, M. Cand, R. Davis, C. Jordan, M. Hayes, R. Perkins, Institute of Acoustics, May 2013.



A.6 Appendix 9.6 – CALIBRATION CERTIFICATES



CERTIFICATE OF CALIBRATION



0653

Date of Issue: 05 October 2021

Certificate Number: UCRT21/2223

Calibrated at & Certificate issued by:
 ANV Measurement Systems
 Beaufort Court
 17 Roebuck Way
 Milton Keynes MK5 8HL
 Telephone 01908 642846 Fax 01908 642814
 E-Mail: info@noise-and-vibration.co.uk
 Web: www.noise-and-vibration.co.uk
 Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages
Approved Signatory
B. Giles

Customer SLR Consulting Limited
 2nd and 3rd Floors
 15 Middle Pavement
 Nottingham
 NG1 7DX

Order No. 422-17278
 Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator
 Identification

Manufacturer	Instrument	Type	Serial No. / Version
Rion	Sound Level Meter	NL-52	00710359
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	10901
Rion	Microphone	UC-59	19633
Rion	Calibrator	NC-75	34713324
	Calibrator adaptor type if applicable		NC-75-022

Performance Class 1
 Test Procedure TP 10. SLM 61672-3:2013
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
 Type Approved to IEC 61672-1:2013 Yes
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
 Date Received 05 October 2021 ANV Job No. UKAS21/10653
 Date Calibrated 05 October 2021

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	Dated	Certificate No.	Laboratory
	Initial Calibration		

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.



CERTIFICATE OF CALIBRATION	Certificate Number UCRT21/2223
	Page 2 of 2 Pages
UKAS Accredited Calibration Laboratory No. 0653	

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title NL-52/NL-42 Description for IEC 61672-1			
SLM instruction manual ref / issue No. 56034 21-03		Source Rion	
Date provided or internet download date 19 March 2021			
	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes
Total expanded uncertainties within the requirements of IEC 61672-1:2013			YES
Specified or equivalent Calibrator Specified			
Customer or Lab Calibrator Customers Calibrator			
Calibrator adaptor type if applicable NC-75-022			
Calibrator cal. date 05 October 2021			
Calibrator cert. number UCRT21/2215			
Calibrator cal cert issued by Lab 0653			
Calibrator SPL @ STP		93.95 dB	Calibration reference sound pressure level
Calibrator frequency		1000.00 Hz	Calibration check frequency
Reference level range		Single dB	
Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15			
Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.			

Environmental conditions during tests		Start	End	
	Temperature	23.40	23.20	± 0.30 °C
	Humidity	39.4	38.3	± 3.00 %RH
	Ambient Pressure	99.21	99.24	± 0.03 kPa

Indication at the Calibration Check Frequency			
Initial indicated level	94.0 dB	Adjusted indicated level	94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±			0.10 dB

Self Generated Noise			
Microphone installed -	Less Than	17.0 dB	A Weighting
Microphone replaced with electrical input device - UR = Under Range indicated			
Weighting	A	C	Z
	11.8 dB UR	15.6 dB UR	22.8 dB UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

..... END

Calibrated by: B. Bogdan R 2





**CERTIFICATE
 OF
 CALIBRATION**



0653

Date of Issue: 05 October 2021

Certificate Number: UCRT21/2220

Calibrated at & Certificate issued by:
 ANV Measurement Systems
 Beaufort Court
 17 Roebuck Way
 Milton Keynes MK5 8HL
 Telephone 01908 642846 Fax 01908 642814
 E-Mail: info@noise-and-vibration.co.uk
 Web: www.noise-and-vibration.co.uk
 Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages
Approved Signatory
B. Giles

Customer SLR Consulting Limited
 2nd and 3rd Floors
 15 Middle Pavement
 Nottingham
 NG1 7DX

Order No. 422-17278
 Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator
 Identification

Manufacturer	Instrument	Type	Serial No. / Version
Rion	Sound Level Meter	NL-52	00710362
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	10904
Rion	Microphone	UC-59	19636
Rion	Calibrator	NC-75	34713324
	Calibrator adaptor type if applicable		NC-75-022

Performance Class 1
 Test Procedure TP 10. SLM 61672-3:2013
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
 Type Approved to IEC 61672-1:2013 Yes
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
 Date Received 05 October 2021 ANV Job No. UKAS21/10653
 Date Calibrated 05 October 2021

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	Dated	Certificate No.	Laboratory

Initial Calibration

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CERTIFICATE OF CALIBRATION	Certificate Number UCRT21/2220
	Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1
SLM instruction manual ref / issue	No. 56034 21-03 Source Rion
Date provided or internet download date	19 March 2021

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013 **YES**

Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	NC-75-022		
Calibrator cal. date	05 October 2021		
Calibrator cert. number	UCRT21/2215		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	93.95	dB	Calibration reference sound pressure level
Calibrator frequency	1000.00	Hz	Calibration check frequency
Reference level range	Single dB		

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
 Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	23.30	23.60	± 0.30 °C
Humidity	40.3	38.7	± 3.00 %RH
Ambient Pressure	99.02	99.11	± 0.03 kPa

Indication at the Calibration Check Frequency

Initial indicated level	93.9	dB	Adjusted indicated level	94.0	dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10	dB

Self Generated Noise

Microphone installed - Less Than 17.1 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A	C	Z
	12.2 dB UR	16.2 dB UR	23.4 dB UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.



Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None


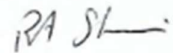
..... **END**

Calibrated by: B. Bogdan R 2



	MTS Calibration Ltd, The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England Telephone: 01642 876 410																				
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Date of Issue: 30 August 2022 Certificate Number: 37315																					
Sound Level Meter																					
Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1																					
Client: Environmental Measurements Unit 12, Tallaght Business Centre Whitestown Business Park Co.Dublin 24, Ireland	Instrument Make: Larson Davis Instrument Model: LxT1L Serial Number: 0005978																				
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Calibration Certificate

Certificate Number 2021012148

Customer:

Environmental Measurement
 Unit 12 Tallaght Business Centre
 Whitestown Business Park
 Dublin, 24, Ireland

Model Number LxT SE
Serial Number 0006600
Test Results **Pass**

Initial Condition As Manufactured

Description Sound Expert LxT
 Class 1 Sound Level Meter
 Firmware Revision: 2.404

Procedure Number D0001.8378
Technician Ron Harris
Calibration Date 28 Sep 2021
Calibration Due
Temperature 23.76 °C ± 0.25 °C
Humidity 50.2 %RH ± 2.0 %RH
Static Pressure 85.46 kPa ± 0.13 kPa

Evaluation Method Tested electrically using Larson Davis PRMLxT 1L S/N 070099 and a 12.0 pF capacitor to simulate microphone capacitance. Data reported in dB re 20 µPa assuming a microphone sensitivity of 23.6 mV/Pa.

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8384:

- | | |
|------------------------|----------------------------|
| IEC 60651:2001 Type 1 | ANSI S1.4-2014 Class 1 |
| IEC 60804:2000 Type 1 | ANSI S1.4 (R2006) Type 1 |
| IEC 61252:2002 | ANSI S1.25 (R2007) |
| IEC 61672:2013 Class 1 | ANSI S1.43 (R2007) Type 1 |
| IEC 61260:2001 Class 1 | ANSI S1.11 (R2009) Class 1 |

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert LxT, I770.01 Rev O Supporting Firmware Version 4.0.5, 2019-09-10

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

LARSON DAVIS - A PCB PIEZOTRONICS DIV.
 681 West 820 North
 Provo, UT 84601, United States
 1-801-684-0001




921-9-28715-22-40

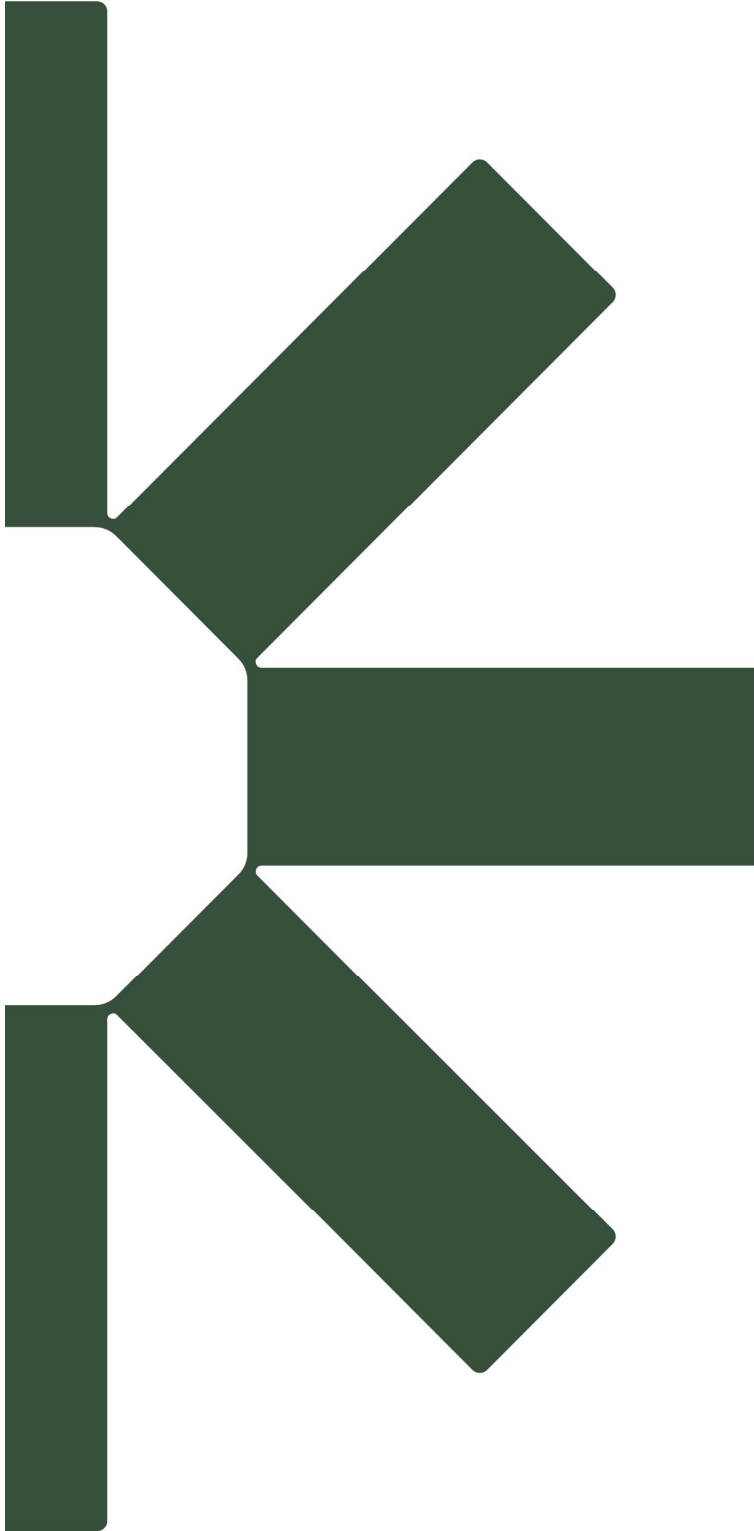
Page 1 of 8

D0001.8407 Rev E



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