Environmental Impact Assessment Report
Volume 3, Appendix 25.5: Operational Stage Onshore Substations Noise Assessment

MarramWind Offshore Wind Farm

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MarramWind

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Contents

1. Introduction

1.1.1.1 This Appendix of the Environmental Impact Assessment (EIA) Report presents the methodology and results of the operational stage noise assessment for the onshore substations of the proposed MarramWind Offshore Wind Farm (hereafter referred to as "Project").

1.1.1.2 There is potential for noise effects relating to the onshore substations during the operational stage of the Project. This Appendix presents the plant and equipment that could potentially be installed at the operational onshore substations and predicts the noise levels likely to be generated at the nearest noise sensitive receptors (NSRs).

1.1.1.3 This Appendix should be read in conjunction with the project description provided in **Volume 1, Chapter 4: Project Description** and the relevant parts of the following chapters and appendices:

- **Volume 1, Chapter 25: Onshore Noise and Vibration.**

1.1.1.4 The Appendix is supported by the following figures:

- **Volume 2, Figure 25.3: Operation Stage Assessment Noise Sensitive Receptors.**

1.1.1.5 Maintenance of equipment associated with the onshore substations will be undertaken predominantly during daytime hours to minimise disruption at nearby receptors. There may also be a need to respond to fault conditions and emergencies both during the day and in the night. Maintenance, faults and emergencies are short duration events and noise generation from these elements has not been assessed in this Appendix.

1.1.1.6 There is no rotating or reciprocating machinery to give rise to vibration associated with out-of-balance forces. Vibration from the onshore substations therefore will be **Negligible** and is not considered in this Appendix.

2. Assessment Criteria

2.1 Overview

2.1.1.1 The following British Standards and technical guidance documents have been considered for the purpose of the noise assessment:

- British Standard (BS) 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142);
- Association of Noise Consultants BS 4142:2014+A1:2019: Technical Note; and
- BS 8233: Guidance on sound insulation and noise reduction for buildings (BS 8233).

2.1.1.2 Further information on these technical guidance documents can be found in **Volume 3, Appendix 25.1: Noise and Vibration Relevant Legislation, Policy and Technical Guidance**.

2.2 Consultation with environmental health of Aberdeenshire Council

2.2.1.1 During consultation with Aberdeenshire Council, Environmental Health has commented in the Aberdeenshire Council Pre-Application Report as follows:

> *"The applicant is expected to undertake a noise impact assessment to predict the impact on sensitive receptors and specify any necessary control measures. The assessment should be undertaken in accordance with BS4142:2014+A1:2019 for external noise with the aim of achieving a low impact depending on context when compared to background L_{A90} and NR25 and NR20 Curve assessment for internal noise during the daytime and night time respectively. The applicant is also expected to consider a cumulative noise impact and demonstrate that it will not cause significant adverse impact on nearby residential amenity."*

2.3 BS 4142 Assessment

2.3.1.1 The impact magnitude and effect level criteria for the operational noise associated with the onshore substations is based upon the guidance contained within BS 4142. Its methodology considers the difference between the sound from the plant (including any correction(s) for noticeable acoustic characteristics) and the prevailing background sound levels. It also allows for the context and the sound levels in absolute terms to be considered. **Table 2.1** details the resulting magnitude of impact and effect level criteria that have been applied. In line with BS 4142, contextual factors such as the character of the noise, the acoustic environment, and the time of day have been considered in determining the likely significance of effects.

2.3.1.2 The concepts for No Observed Effect Level (NOEL), Lowest Observable Adverse Effect Level (LOAEL) and Significant Observable Adverse Effect Level (SOAEL) are introduced in the Noise Policy Statement for England (NPSE, 2010) and they have been adopted for this assessment in absence of specific criteria in Scotland. The LOAEL and SOAEL effect levels adopted for the operational stage noise assessment are also detailed within **Table 2.1**.

Table 2.1 Operational noise impact magnitude criteria

Increase of rating level over representative background sound level, dB $L_{Ar,Tr}$ (1) (2) (3)	**Impact Magnitude**	**Effect Level(4)**
≥ +10	High	SOAEL
≥ +5 and < +10	Medium	LOAEL-SOAEL
≥ 0 and < +5	Low	LOAEL
< 0	**Negligible**	NOEL

Notes:
(1) The Impact Magnitude, based upon the difference between rating and background levels, is an initial estimate of impact, depending on context. These are not absolute criteria and may be increased or decreased depending on the environment of the receptor.
(2) The above criteria apply equally to the daytime or night-time condition, i.e. daytime rating level, dB $L_{Ar,Tr}$, when compared with the daytime representative background sound level, dB $L_{A90,T}$; or the night-time rating level, dB $L_{Ar,Tr}$, when compared with the night-time representative background sound level, dB $L_{A90,T}$.
(3) The representative daytime and night-time background sound levels are derived using the $L_{A90,15min}$ metric and following the procedure described in BS 4142.
(4) the LOAEL and SOAEL will be set with reference to absolute levels and BS 4142 with the understanding of site context.

2.4 Noise rating (NR) curves

2.4.1.1 Due to concerns in relation to low frequency noise, Aberdeenshire Council has requested a NR curve assessment is undertaken for internal noise levels. In order to meet the NR curve requirements, i.e. NR20 and NR25, sound pressure levels are required to be below the curve limit level in each octave band as set out in BS 8233 and shown in **Table 2.2**.

Table 2.2 Internal NR curve sound pressure levels

	Octave Band Level / dB_{Lin}								
	31.5	63	125	250	500	1000	2000	4000	8000
NR25	72	55	44	35	29	25	22	20	18
NR20	69	51	39	31	24	20	17	14	13

3. Operation Stage Noise Assessment Methodology

3.1 Overview

3.1.1.1 The assessment of noise likely to be generated by the onshore substations during the operational stage has been undertaken in accordance with the guidance contained within BS 4142 and BS 8233. A 3D noise model has been developed using CadnaA64_2025_1_211 which uses the International Organization for Standardization (ISO) 9613-2:2024 prediction methodology. The margin of compliance / exceedance of the assessment criteria has been used to determine whether a significant effect would arise.

3.1.1.2 As the design of the onshore substations has not yet been finalised, the operational noise modelling has been undertaken using assumptions related to source noise levels and embedded environmental measures. As set out in **Volume 1, Chapter 4**, the onshore substation(s) electrical infrastructure may require to be fully housed in buildings or be partially placed outdoors. Consequently, both options of fully enclosed and partially enclosed substations are considered as part of the operational stage noise assessment. However, the requirement for and extent of mitigation will be dependent upon the spatial arrangement of buildings, internal site layout and selection of equipment in the final design.

3.2 Model configuration and source data

3.2.1 General modelling assumptions

3.2.1.1 Operational noise sources associated with the onshore substations were modelled within CadnaA. The noise model configuration and general modelling assumptions are detailed below:

- propagation was undertaken using the ISO 9613-2:2024 calculation methodology;
- orders of reflection: 2;
- ground absorption: 0.75 (for instance, 75% soft ground between source and receiver);
- topographical data: Open-source DTM (Digital Terrain Model) data at 2m spatial resolution; and
- receptor height is assumed to be 4m (equivalent to a first-floor window).

3.2.1.2 As set out in **Volume 1, Chapter 4**, there will be one onshore substation for each of the three project phases. The noise modelling assumes that all three onshore substations will be operational, and the maximum design envelope is based on sound power levels assumed for each of the onshore substations as set out in **Section 3.2.2**.

3.2.1.3 As set out in **Volume 1, Chapter 4**, a decision has not yet been made on whether the electrical components and equipment will be fully housed in buildings or whether this equipment will be partially placed outdoors, incorporating sufficient mitigation to meet the necessary noise limits. The noise modelling undertaken therefore considers both scenarios, i.e. fully enclosed and partially enclosed substations.

3.2.1.4 Further details on the assumptions around which equipment could be enclosed and / or screened where equipment will be partially enclosed, together with the sound reduction performances of buildings in both the partially enclosed and fully enclosed scenarios, is

included in **Section 3.2.2**. The noise sources were modelled at a height representative of the proposed buildings, with the majority of the sound energy placed between the mid-point and highest point of the buildings or outdoor equipment. Where equipment is partially enclosed, the model allows for acoustic screening provided by two buildings to replicate internal screening between high voltage alternating current and high voltage direct current (HVDC) onshore substations provided by HVDC buildings.

3.2.2 Model input data

3.2.2.1 The data used to derive the worst case-unmitigated sound power levels of the modelled onshore substations are included in **Table 3.1.**

Table 3.1 Model inputs – unmitigated equipment items and sound power levels

Onshore substation	Equipment	Number of items	Sound power per item L_{wA}dBA
Phase 1 onshore substation	Main transformers	1	91
	Main transformer coolers	1	91
	STATCOM transformers	1	90
	STATCOM transformers cooling fans	1	91
	STATCOM cooling fans	2	80
	STATCOM reactors	3	93
	STATCOM capacitors	1	83
	STATCOM auxiliary earthing transformers	1	80
	275kV shunt reactors	2	102
	400kV shunt reactors	1	105
	275kV harmonic filters (1 bank of 3 units)	1	88
	400kV harmonic filters (1 bank of 3 units)	1	88
	Room extractor vents (various rooms)	15	76
Phase 2 onshore substation	Main transformers	2	91
	Main transformers coolers	2	91
	STATCOM transformers	2	90
	STATCOM transformers cooling fans	2	91
	STATCOM cooling fans	4	80
	STATCOM reactors	6	93
	STATCOM capacitors	2	83

Onshore substation	Equipment	Number of items	Sound power per item L_{wA}dBA
	STATCOM auxiliary earthing transformers	2	80
	275kV shunt reactors	4	102
	400kV shunt reactors	2	105
	275kV harmonic filters (1 bank of 3 units)	2	88
	400kV harmonic filters (1 bank of 3 units)	2	88
	Room extractor vents (various rooms)	20	76
Phase 3 onshore substation	Converter transformers	6	110
	Converter transformers coolers	6	90
	Converter coolers	2	100
	DC reactor	6	95
	Chopper reactor	2	95
	Auxiliary earthing transformers	2	75
	PLC Filter 1	1	80
	PLC Filter 2	1	82
	400kV harmonic filter	2	88
	Air handling units	20	82
	Control room and spare building	2	94

3.2.3 Partially enclosed and fully enclosed scenarios

3.2.3.1 As set out in **Volume 1, Chapter 4**, a decision has not yet been made on whether the electrical components and equipment will be fully housed in buildings or whether this

equipment will be partially placed outdoors, incorporating sufficient mitigation to meet the necessary noise limits.

3.2.3.2 **Table 3.2** sets out the assumptions of embedded environmental measures for the partially enclosed and fully enclosed assessment scenarios, for instance, the noise level attenuation related to the assumed sound power levels shown in **Table 3.1**. It should be noted that for the partially enclosed onshore substations assessment scenario, this assessment presents an example of which equipment could be enclosed and associated sound reduction performance of these buildings to reduce the noise generated by the onshore substations to avoid a significant effect in EIA terms. Further assessment would be required to determine the final mitigation requirements at a detailed design stage and once a decision has been reached as to which electrical components and equipment will be fully housed in buildings or whether this equipment will be partially enclosed.

3.2.3.3 **Table 3.2** shows the noise level attenuation related to the assumed sound power levels.

Table 3.2 Embedded environmental measures

Assessment scenario	Assumed performance of the embedded environmental measures
Partially enclosed onshore substations	Assumes a 35dB reduction in the sound power would be achievable for the building and / or an additional acoustic enclosure for the transformers in Phase 3 onshore substations. Including: • the converter transformers, DC reactor and chopper reactor. Assumes a 25dB reduction in the sound power would be achievable for the buildings / acoustic enclosures housing transformers. Including: • the main transformers and STATCOM transformer of the Phase 1 onshore substations; and • the main transformers and STATCOM transformer of the Phase 2 onshore substations. Assumes a 15dB reduction in the sound power would be achievable for building / acoustic enclosures housing the shunt reactors. Including: • the 275kV shunt reactors, 400kV shunt reactors and STATCOM reactors of the Phase 1 onshore substation; and the 275kV shunt reactors, 400kV shunt reactors and STATCOM reactors of the Phase 2 onshore substation. Assumes through careful design a 15-20dB reduction in sound power would be achievable for transformer coolers. Including: • the main transformer coolers and STATCOM cooling fans of the Phase 1 onshore substations; • the main transformer coolers and STATCOM cooling fans of the Phase 2 onshore substations; and • the converter transformer coolers and converter coolers of the Phase 3 onshore substations. This may be achieved through low noise plant, attenuators and fan design (such as location / orientation of fans away from nearest receptors) and / or localised barriers. Assumes a 10dB reduction in the sound power would be achievable for the 400kV Harmonic filters of the Phase 3 onshore substation, and 275kV and 400kV Harmonic filters of the Phase 1 and 2 onshore substations. Assumes a 15dB reduction in sound power would be achievable for the Control room and spare building of the Phase 3 onshore substations.
Fully enclosed onshore substations	Assumes a 25-30dB reduction in the sound power would be achievable for all buildings.

3.3 Assessment locations

3.3.1.1 The locations of the nearest NSRs considered in the operational noise assessment are described in **Table 3.3** and identified in **Volume 2, Figure 25.3**.

Table 3.3 Assessment locations

Operational stage NSR location	Ordnance survey co-ordinates	
	x	y
NSR1 Hawthorn Cottage	408860	846345
NSR2 Howiemuir	408532	845744
NSR3 Denholm	408137	845582
NSR4 East Thunderton	407498	846227

3.4 Background noise levels

3.4.1.1 The baseline noise survey has input into the operational stage noise assessment. The representative background sound levels for daytime and night-time periods have been determined in line with guidance provided in BS 4142. Note that periods where weather conditions were not suitable for the measurement of environmental noise (i.e. wind speeds >5m/s and / or during periods of rain) were excluded from the dataset when determining the representative background sound level.

3.4.1.2 Further information on the baseline noise survey can be found in **Volume 3, Appendix 25.2: Baseline Noise Survey**.

4. Operational Stage Noise Assessment

4.1 Initial estimate BS 4142 noise assessment

4.1.1.1 A summary of the initial BS 4142 operational noise assessments for the partially enclosed and fully enclosed scenarios during the daytime and night-time periods is provided in **Table 4.1** and **Table 4.2** respectively**.**

4.1.1.2 With the embedded environmental measures in place, the tonality from transformers will be minimised. As such, a 2dB penalty for low tonality has been applied for the BS 4142 assessment.

Table 4.1 Initial BS 4142 assessment for the daytime period, including embedded environmental measures

NSR	Specific sound level, dB $L_{Aeq,T}$	Acoustic feature correction, dB	Rating level, dB $L_{Ar,Tr}$	Daytime back-ground sound level, dB L_{A90}	Excess of daytime back-ground sound level, dB
Partially enclosed onshore substations scenario:					
NSR1 Hawthorn Cottage	34	+2	36	38	Does not exceed background
NSR2 Howiemuir	35	+2	37	33	+4
NSR3 Denholm	32	+2	34	33	+1
NSR4 East Thunderton	32	+2	34	40	Does not exceed background
Fully enclosed onshore substations scenario					
NSR1 Hawthorn Cottage	25	+2	27	38	Does not exceed background
NSR2 Howiemuir	32	+2	34	33	+1
NSR3 Denholm	31	+2	33	33	Does not exceed background
NSR4 East Thunderton	25	+2	27	40	Does not exceed background

Table 4.2 Initial BS 4142 assessment for the night-time period, including embedded environmental measures

NSR	Specific sound level, dB $L_{Aeq,T}$	Acoustic feature correction, dB	Rating level, dB $L_{Ar,Tr}$	Night-time back-ground sound level, dB L_{A90}	Excess of night-time back-ground sound level, dB
Partially enclosed substations scenario					
NSR1 Hawthorn Cottage	34	+2	36	33	+3
NSR2 Howiemuir	35	+2	37	28	+9
NSR3 Denholm	32	+2	34	28	+6
NSR4 East Thunderton	32	+2	34	32	+2
Fully enclosed substations scenario					
NSR1 Hawthorn Cottage	25	+2	27	33	Does not exceed background
NSR2 Howiemuir	32	+2	34	28	+6
NSR3 Denholm	31	+2	33	28	+5
NSR4 East Thunderton	25	+2	27	32	Does not exceed background

4.1.1.3 The results of the initial daytime BS 4142 assessment, depending on context, indicates that, at worst, for the partially enclosed scenario, the rating level would be +4 dB above the background. For the fully enclosed scenario the rating level would be +1 dB above the background. This is an indication that the onshore substations could be approaching an adverse impact at the nearest NSRs to the Project.

4.1.1.4 The results for the initial night-time BS 4142 assessment, depending on context, indicates that, at worst, the rating level would be +9 dB above background for the partially enclosed scenario and +6 dB above the background for the fully enclosed scenario. This is an indication that the onshore substations could have an adverse impact at the nearest NSRs of the Project during the night.

4.2 Contextual considerations

4.2.1 BS 4142 contextual considerations

4.2.1.1 As shown in **Table 4.1** and **Table 4.2**, it can be seen that the measured backgrounds at NSR2 Howiemuir and NSR3 Denholm are low.

4.2.1.2 The Association of Noise Consultants' Technical Note on BS 4142:2014+A1:2019 states that:

> *"BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30dB LA90, and low rating levels as being less than about 35dB $L_{Ar,Tr}$. The [ANC working group] suggest that similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate."*

4.2.1.3 Although it is a rural area, the ambient noise levels at these NRSs typically range between 45 and 50 dB $L_{Aeq,15mins}$ during the daytime period and 42 and 49 dB $L_{Aeq,15mins}$ during the night-time period. In the context of the location of the onshore substations a 35 dB L_{ArTr} rating level is therefore considered to be a low magnitude of impact and an appropriate effect level for the LOAEL. The onshore substations will therefore be designed to meet this level.

4.2.2 Additional mitigation

4.2.2.1 In order to achieve a maximum rating level of 35 dB $L_{Ar,Tr}$, an additional 2 dB reduction is required in the partially enclosed scenario at the nearest NSR of Howiemuir (NSR2).

4.2.2.2 It is considered that the additional 2 dB may be achieved through a combination of:

- use of quieter plant than assessed;
- orientation of the onshore substations buildings to screen external noise elements from nearest receptors, location of vents and louvres away from facades opposing receptors; and
- use of low-noise modes on onshore substations plant that reduce tonality.

4.2.2.3 Once a decision has been reached as to whether the onshore substations will be partially enclosed or fully enclosed, and detailed design and final plant selection information is available, it will be necessary to undertake an updated noise assessment to demonstrate that the final design meets the 35 dB $L_{Ar,Tr}$ rating level requirement and would correspond to LOAEL.

4.2.3 NR curve assessment

4.2.3.1 The NR curve assessment at the nearest NSR of Howiemuir (NSR2) has been undertaken using the following assumptions:

- Bedroom dimensions are assumed to be: Width 3.4m, Depth 3.4m, Height 2.4m;
- A reverberation time of 0.5s; and
- The sound insulation assumptions are shown in **Table 4.3**. The sound level reduction used for an open window is derived from "G" side-opening window in timber frame

(50,000mm^2 opening) taken from the NANR 116 Department for Environment, Food and Rural Affairs research project.

Table 4.3 Octave band sound performance values assumed for typical façade components, dB

Sound reduction performance by octave band	Octave band centre frequency / Hz								Single Figure Performance
	63	125	250	500	1000	2000	4000	8000	
Open Window (50,000mm^2)	25	19	21	20	19	18	20	N/A	18 ($D_{n,e,w}$)
Glazing (6/12/6 double glazing) 1m^2	20	20	19	29	38	36	45	40	32 (R_w)
Façade (103mm brick) 8.5m^2	30	43	36	41	49	54	55	55	46 (R_w)

4.2.3.2 For the partially enclosed scenario, a worst-case sound pressure level of 33 dB(A) has been used. As a further worst case assumption, all the sound energy is assumed to be within the 125Hz 1/3 octave band, therefore a sound level of $L_{lin,eq,100Hz}$ 54dB is used in the calculation.

4.2.3.3 For the fully enclosed scenario, a worst-case sound pressure level of 32dB(A) has been used. As a further worst case assumption, all the sound energy is assumed to be within the 125Hz 1/3 octave band, therefore a sound level of $L_{lin,eq,100Hz}$ 52dB is used in the calculation.

4.2.3.4 The resultant levels are assessed in **Table 4.4**.

Table 4.4 NR curve assessment

Location	External sound level / dBA	External 125Hz sound pressure level dB_{lin}	Internal 125Hz sound pressure level dB_{lin}	Exceedance of NR curve criterion
Partially enclosed substations scenario				
Daytime				
Howiemuir (NSR2)	33	49	34	Meets NR 25
Night-time				
Howiemuir (NSR2)	33	49	34	Meets NR 20
Fully enclosed substations scenario				
Daytime				
Howiemuir (NSR2)	32	48	33	Meets NR 25
Night-time				

Location	External sound level / dBA	External 125Hz sound pressure level dB_{lin}	Internal 125Hz sound pressure level dB_{lin}	Exceedance of NR curve criterion
Howiemuir (NSR2)	32	48	33	Meets NR 20

4.2.3.5 With embedded environmental measures, both the partially enclosed and fully enclosed scenarios, meet the internal daytime and night-time noise criteria requested by Aberdeenshire Council.

5. References

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6. Glossary and Abbreviations

6.1 Abbreviations

Acronym	Definition
BS	British Standard
EIA	Environmental Impact Assessment
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ISO	International Organization for Standardization
LOAEL	Lowest Observable Adverse Effect Level
NOEL	No Observed Effect Level
NR	Noise Rating
NSR	Noise Sensitive Receptors
SOAEL	Significant Observable Adverse Effect Level

6.2 Glossary of terms

Term	Definition
Acoustic environment	Sound from all sources as modified by the environment.
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.
Ambient sound level	The $L_{Aeq,T}$, of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Baseline	Refers to existing conditions as represented by latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of development.
Background sound level	The underlying level of sound over a period, T, and is represented by $L_{A90,T}$, the level exceeded for 90% of the measurement interval T.
BS 4142	BS 4142:2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound.
BS 82333	BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings.

Term	Definition
dB	A unit used to measure the intensity of a sound or the power level of an electrical signal by comparing it with a given level on a logarithmic scale.
Frequency in Octave Bands	A range of frequencies where the upper frequency limit is twice that of the lower frequency limit. For example, the 1000Hertz octave band contains acoustic energy at all frequencies from 707 to 1414Hertz.
Frequency in One Third Octave Bands	Octave bands that are sub-divided into three parts, equal to 23% of the centre frequency. Used when octave analysis does not provide sufficient detail. Divides the audio spectrum into 33 or more equal parts where the cut-off frequencies have a ratio of 21/3, which is approximately 1.26. For example, a 1kHz third-octave band filter has a centre frequency of 1,000 Hz with lower and upper frequencies of 891Hz and 1,112Hz, respectively.
Hertz (Hz)	The number of waves per second. The unit of measurement for frequency of a sound wave.
$L_{A90,T}$	The A-weighted sound pressure level that is exceeded for 90% of a given time interval, T. Known as the ‘background sound level’.
$L_{Aeq,T}$	The A-weighted equivalent continuous sound level. It is the notional continuous level that, over the defined time period, T, contains the same sound energy as the actual fluctuating sound that occurred over the same time period.
$L_{AN,T}$	The level of A-weighted noise exceeded for N% of the measurement time T. Note that the time weighting (usually Fast) is sometimes included, denoted by ‘F’ (for example, $L_{AFN,T}$).
Mean (average)	The arithmetic average of a set of numbers, for example, add up the numbers and divide by the number of numbers.
Modal (average)	The mode is the number in a dataset that is repeated more often than any other number in the same set.
Noise	A term used to describe ‘unwanted sound’ or any sound that is undesired by the recipient.
Root mean square (rms)	Root Mean Square of a time-varying quantity is obtained by squaring the amplitude at each instant, obtaining the average of the squared values over the interval of interest, and then taking the Square Root of this average.
Sound	A term used to describe airborne waves that can be heard.
Sound level meter (SLM)	SLM is the instrument used for acoustic (sound that travels through air) measurements. It is commonly a hand-held instrument with a microphone. The diaphragm of the microphone responds to changes in air pressure caused by sound waves.

Term	Definition
Sound pressure level (L_p)	Sound pressure level is the RMS value of the Instantaneous Sound Pressures measured over a specified period of time, measured in decibels (dB) to a given reference pressure level.
Specific sound level	An equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr.
Time weighting	Time weightings determine how quickly the sound level meter responds to changes in sound pressure level. Fast time weighting: the sound level meter samples over a few discrete 125ms periods, with all parameters calculated from these 125ms measurements. For example, a 15-minute measurement period is actually 432,000 individual measurements. Slow time weighting: the sound level meter samples over several discrete 1 second periods, with all parameters calculated from these 1 second measurements.
Weighting network	An electronic filter in a sound level meter, which approximates, under defined conditions, the frequency response of the human ear. The A- weighting network is most commonly used.

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