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Technical Appendix 10.3

Battery Energy Storage System (BESS) Noise Report

Kellystown Wind Farm

EDF Renewables Ireland Ltd

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COMMERCIAL IN CONFIDENCE

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1 Introduction

TNEI Ireland Ltd was commissioned by EDF Renewables Ireland Ltd (the Applicant) to undertake a Noise Impact Assessment (NIA) for the operation of a Battery Energy Storage System (BESS), substation and associated plant, which forms part of the Proposed Kellystown Wind Farm Development (the Proposed Development).

The method of assessment of operational noise for a BESS is very different from that used for the assessment of operational wind turbine noise, and the two assessment types cannot be combined. Accordingly, the assessment of operational noise attributable to the BESS is presented separately here in this report, and the operational wind farm noise assessment is provided in a Technical Appendix 10.2.

The Proposed Substation and BESS is to be located at the approximate ITM grid coordinates 708828, 782956. The land surrounding the proposed BESS is rural in nature, with the M1 Motorway running north to south approximately 3.5 km to the east of where the BESS is located. There are clusters of residential properties along the adjacent roads, the nearest of which are approximately 300 m to the east and 450 m to the south.

The aims of this BESS NIA are to:

- Identify the potential noise sensitive receptors in the vicinity of the proposed BESS;
- Identify the primary sound sources associated with the operation of the BESS;
- Calculate the likely levels of operational noise at the identified receptors to determine the noise impacts associated with the operation of plant within the BESS; and
- Indicate any requirements for mitigation measures, if required, to provide sufficient levels of protection for all noise sensitive receptors.

1.1 Nomenclature

Please note the following terms and definitions, which are used throughout this report:

- **Emission** refers to the noise level emitted from a noise source, expressed as either a sound power level or a sound pressure level;
- **Immission** refers to the sound pressure level received at a specific location from a noise source;
- **SWL** indicates the sound power level in decibels (dB);
- **SPL** indicates the sound pressure level in decibels (dB);
- **NML** (Noise Monitoring Location) refers to any location where baseline noise levels have been measured;
- **NSRs** (Noise Sensitive Receptors) are all identified receptors which are sensitive to noise; and
- **BNAL** (BESS Noise Assessment Location) refers to any location where the noise immission levels are calculated and assessed.

A Glossary of Terms is also provided as Annex 1 of this report.

All figures referenced within the report can be found in Annex 5.

Unless otherwise stated, all sound levels refer to free field levels i.e. sound levels without influence from any nearby reflective surfaces.

All grid coordinates refer to the Irish Transverse Mercator (ITM) coordinate system using ITM X and ITM Y, unless stated otherwise.

2 Project Description

2.1 Description of the Proposed Compound

The compound would introduce new sound sources to the local area in the form of externally located fixed plant. The BESS is expected to consist of a number of liquid cooled battery cubes, which would be connected into a series of Power Conversion Units (PCS), each consisting of a pair of inverters and a medium voltage (MV) transformer. It is also assumed that a High Voltage (HV) Grid Transformer will be located within the adjacent substation. Some auxiliary plant and switch gear may be associated with the operation of the HV transformer but would be insignificant in noise output in comparison to the HV transformer itself.

Specifically, the dominant sound sources considered within this assessment are assumed as follows:

- BESS Units: Wartsila Gridsolv Quantum, 32 of;
- PCS Inverters: PE HEMK PCSK Inverter, 4 of;
- PCS transformers: Chint Electric MV Transformer, 2 of; and
- Substation: HV Grid Transformer, 1 of.

An indicative layout plan providing an overview of the proposed BESS development in Annex 2.

2.2 Study Area

Noise Sensitive Receptors (NSRs) considered in this assessment are nearby residential properties and the study area for this assessment has been defined through the identification of houses within 2 km of the Proposed Development. The closest NSR is located approximately 300 m to the east of the BESS, with other receptors at similar or greater distances. Figure A5.1 and Figures A5.1a-c in Annex 5 detail the noise assessment study area.

3 Assessment Methodology

3.1 Legislation and Policy Context

There is no Irish guidance that contains a detailed method for the assessment of environmental noise from new noise generating developments, however, to address this gap and try to bring consistency across Local Authorities, the Association of Acoustic Consultants of Ireland have published '*Environmental Noise Guidelines for Local Authority Planning & Enforcement Departments*' [(1)] (ENG), which states the following regarding the use of BS 4142 [(2)] (in relation to Industrial developments); *"Useful guidance is additionally presented in British Standard BS 4142:2014 Methods for rating and assessing industrial and commercial sound (2014), which provides an assessment methodology based on existing background levels."*

The ENG also refers to BS 8233 [(3)], stating;

"Although not an environmental noise standard, BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (2014) is occasionally referenced in noise impact assessments due to its inclusion of recommendations for internal noise levels. The standard is not directly applicable to the assessment of impacts from external sources on building occupants. However, the standard lists internal noise criteria to facilitate use and enjoyment of certain building types, and these criteria are useful in providing a reference".

3.2 Assessment Methods

Typically, assessments of environmental noise are based on a comparison of likely noise levels against either 'context' based limits or a set of fixed limits.

Context based limits are set relative to the existing noise environment and may also consider the characteristics of the noise source(s), whilst fixed limits are usually set regardless of the existing noise environment or type of noise source(s).

3.2.1 'Context' Based Limits (BS 4142:2014 +A1:2019)

BS 4142:2014+A1:2019 is commonly used to assess the potential impacts of new industrial sound sources on nearby receptors.

The BS 4142 form of assessment is based on the predicted or measured levels of an assessed sound source compared to the measured background sound levels without the specific sound source present and uses, *"outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident".*

BS4142 uses the following definitions;

- **Ambient Sound**: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far. Described using the metric, $L_{Aeq\ (t)}$.
- **Specific Sound Level**: Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, *Tr*. Described using the metric $L_{Aeq\ (t)}$. Also referred to in this Appendix as the *Immission Level*.
- **Residual Sound Level**: Equivalent continuous A-weighted sound pressure level of the residual sound without the specific sound source(s) present at the assessment location over a given time interval, *T*. Described using the metric $L_{Aeq\ (t)}$.
- **Background Sound Level**: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*, measured using time

weighting *F* and quoted to the nearest whole number of decibels. Described using the metric $L_{A90\,(t)}$.

- **Rating Level**: The Specific Sound Level adjusted for the characteristics of the sound. The Rating Level is calculated by adding a penalty or penalties (if required) to the Specific Sound Level when the sound source contains audible characteristics such as tonal, impulsive or intermittent components. Described using the metric, $L_{Aeq\,(t)}$.

BS 4142 is a qualitative assessment, not a quantitative assessment i.e. it does not simply provide a pass or fail result by comparing a predicted noise level to a noise limit. Rather, it considers predicted levels in context with the wider setting to estimate whether adverse impacts may occur.

The starting point of the BS 4142 assessment is to compare the Rating Level with the background sound level, however, where background sound levels are very low and where Rating Levels are also low, the standard suggests it may be more appropriate to consider the absolute levels, rather than comparing directly to the background. The Associate of Noise Consultants (ANC) provide additional information on this in the BS 4142 Technical Guide [4]:

"BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30 dB is 10 dB above a background sound level of 20 dB, i.e., an initial estimate of a significant adverse impact is modified by the low rating and background sound levels.

There may be situations where the opposite is true, and it is for the assessor to justify any modifications to the initial estimate of impact. 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 30 dB L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$. The WG [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."

3.2.2 Fixed Guideline Levels (BS 8233:2014)

BS 8233 '*Guidance on sound insulation and noise reduction for buildings*' presents guideline noise levels for daytime and night-time for the design of a number of different building types. For residential developments, these are based on guidelines issued by the World Health Organisation (WHO).

The Standard states; *"In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4."* Table 4 is reproduced here as **Error! Reference source not found.**.

Table 3.1: Indoor Ambient Noise Levels for Dwellings (*BS 8233:2014 Table 4*)

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq(16hour)}$	-
Dining	Dining room/area	40 dB $L_{Aeq(16hour)}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq(16hour)}$	30 dB $L_{Aeq(8hour)}$

The *Acoustics, Ventilation and Overheating Guide (AVO)* [5], jointly published by the UK's ANC and the Institute of Acoustics (IOA), suggests that a value of 13 dB is an appropriate to convert between

internal and external sound levels for a partially open window. Therefore, an assessment of external noise levels can assume an external noise level limit of 13 dB above those values detailed within **Error! Reference source not found.** (i.e. to achieve an internal night-time level of 30 dB $L_{Aeq(8hour)}$ with windows open, the external sound level must not exceed 43 dB $L_{Aeq(8hour)}$.

3.3 Calculation Method

3.3.1 Noise Propagation Model (ISO 9613-2:1996)

To predict the noise immission levels attributable to the proposed BESS development a noise propagation model was created using the propriety noise modelling software CadnaA. Within the software, complex models can be produced to simulate the propagation of noise according to a wide range of international calculation standards.

For this assessment noise propagation was calculated in accordance with ISO 9613 '*Acoustics – Attenuation of Sound During Propagation Outdoors*'[6] using the following input parameters:

- Temperature was assumed to be 10°C and relative humidity as 70%;
- A ground attenuation factor of 1 (soft ground) was used, except for areas of hardstanding where a ground attenuation factor of 0 (hard ground) was used; and
- Receiver heights were set to 4 m, to replicate the height of a first floor (bedroom) window. At lower heights, noise levels would typically be slightly lower.

3.3.2 Uncertainties and Limitations

Modelled sound sources represent candidate plant only and an indicative site layout. The noise output of individual items of plant may vary from what is presented in this report after final plant specification and procurement.

The noise propagation model is designed to give a good approximation of the specific sound level and the contribution of each individual sound source; however, it is expected that measured levels are unlikely to be matched exactly with modelled values and the following limitations in the model should be considered:

- In accordance with ISO 9613, all assessment locations are modelled as downwind of all sound sources and propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night. These conditions are favourable to noise propagation;
- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for; and,
- The model assumes all sound sources are operating continuously, simultaneously and at maximum noise output.

All of these elements will favour noise propagation and predicted levels will tend to be higher than the noise levels that will actually occur.

4 Baseline Sound Level Monitoring

TNEI undertook an operational wind turbine noise assessment for the proposed Kellystown Wind Farm. As part of the study, TNEI undertook continual background sound level monitoring between the 8th February 2023 and the 20th April 2023 at seven neighbouring properties.

Table 4.1 details all seven Noise Monitoring Locations (NMLs), which are being used in this assessment. The NMLs are also shown on Figure A5.1 included within Annex 5.

Table 4.1: Baseline Noise Monitoring Locations

NML	Approximate Distance and bearing to BESS plant (m)	Coordinates (ITM X, Y)	
NML1	1,009 m north	709238	783878
NML2	437 m east	709252	783061
NML3	443 m south	708771	782517
NML4	1,374 m southwest	707615	782310
NML5	2,672 m west	706345	783944
NML6	2,922 m northwest	706401	784583
NML7	1,776 m north	708661	784724

The noise monitoring equipment consisted of Rion NL-31's, Rion NL-32's and a Rion NL-52 Sound Level Meter (SLM), fitted with appropriate environmental wind shields. All noise monitoring equipment (calibrator, SLM and microphones) used for the study are categorised as Class 1, as specified in IEC 61672-1 *'Electroacoustics. Sound level meters. Specifications'* [7]. The equipment was calibrated onsite at the beginning and end of each measurement period with no significant deviations noted.

Wind speed and direction data was measured continuously during the noise survey using a LIDAR unit, which was temporarily installed within the Proposed Development redline boundary.

For wind farm operational noise assessments the measured noise data is organised into wind speed 'bins' to determine wind-speed specific noise limits. In contrast, BS 4142 states, *'Exercise caution when making measurements in poor weather conditions, such as wind speeds greater than 5 m/s.'* Accordingly, the noise data was filtered to remove any data points that were measured during periods of high wind speeds and rain. In this particular case, all noise data measured with wind speeds at or above 5 ms^{-1} has been removed. BS 4142 suggest that wind speed measurements should be undertaken at the NMLs, at comparable measurement heights to the Sound Level Meters. Therefore, the approach undertaken here in using wind speed measurements captured by a LiDAR unit on the site, measuring at the turbine hub height and then standardising to 10 m, is a more cautious approach. This is due to the resulting higher wind speeds than if measurements were undertaken at each NML at a height of 1.5 m.

Table 4.2 presents an overview of the measured baseline sound levels.

Table 4.2: Measured baseline sound levels

NML	Residual Sound $L_{Aeq(10mins)}$		Mean $LA90_{(10mins)}$		Mode $LA90_{(10mins)}$		Range $LA90_{(10mins)}$	
	Day	Night	Day	Night	Day	Night	Day	Night
NML1	43	32	34	27	33	22	35	29
NML2	46	36	37	30	38	29	34	23
NML3	47	30	34	25	37	22	46	28
NML4	42	32	35	28	32	18	48	28
NML5	49	46	46	43	45	41	20	20
NML6	52	44	44	38	43	37	35	37
NML7	44	37	37	32	39	34	27	25

Table 4.3 details the representative background sound levels, $L_{A90\ (10mins)}$, which have been determined after considering the distribution of data for each measurement period. Typically, baseline sound level measurements made in accordance with BS 4142 are undertaken in 15-minute periods. However, as the baseline data was measured for the operational wind turbine noise assessment, a 10-minute measurement period was adopted for use as part of this assessment. Annex 3 contains the statistical and distribution analysis charts used to ascertain the representative background sound levels.

Table 4.3: Representative Background Sound level, dB $L_{A90(10mins)}$

NML ID	Daytime $L_{A90(10mins)}$	Night-time $L_{A90(10mins)}$
NML1	33	23
NML2	38	29
NML3	35	23
NML4	34	27
NML5	45	41
NML6	43	37
NML7	37	31

The daytime representative background sound level at all NMLs is 30dB $L_{A90(10mins)}$ or higher. During the night-time, however, the background sound level is below 30 dB $L_{A90(10mins)}$ at NMLs 1 - 4, which can be classified as 'very low' (see Section 3.2.1).

5 Operational Noise Impacts

5.1 Modelling of Individual Sound Sources

The noise model considers all of the sound sources detailed within Section 2.1 and the following paragraphs describe how each sound source has been incorporated into the noise model.

Noise modelling is based on candidate plant typical for the size and class of the proposed development and, where possible, data sheets for candidate items of plant have been provided within Annex 4. It should be noted that final plant specifications will vary during detailed design and the tendering process.

The noise data for the Wartsila units, MV Transformers and Inverters has been provided to TNEI under a Non-Disclosure Agreement and as such detailed noise level data cannot be provided in this report. TNEI would be happy to discuss this data in more detail with the Local Authority, if required.

5.1.1 BESS Units: Wartsila Gridsolv Quantum Unit

The Wartsila Gridsolv Quantum units have two main noise sources. These are the two Envicool chiller units which are located on opposing faces of each Wartsila unit. The Wartsila units have been modelled as a box with two area sources to represent the chillers located on the opposing faces. Each chiller unit has an overall broadband sound power level (SWL) of 75 dBA which has been modelled in octave bands.

5.1.2 PCS Inverters: PE HEMK PCSK Inverter

The Inverters have been modelled as boxes consisting of five area sources (four facades and the roof) with an overall broadband SWL of 92 dBA. The area sources have been modelled with sound power levels in in third-octave bands. It is assumed that the inverters will be operating with a fan speed of 80%, without any additional noise controls.

5.1.3 PCS Transformers: Chint Electric MV Transformer

The MV transformers have been modelled as boxes consisting of five area sources (four facades and the roof) with an overall broadband SWL of 73 dBA. The area sources have been modelled with sound power levels in octave bands.

5.1.4 Substation: HV Grid Transformer

The modelled HV transformer has been assumed to be an ABB HV transformer with an overall broadband SWL value of 88 dBA. The transformer has been modelled as a box consisting of five area sources (four facades and the roof). Table 5.1 details the resulting overall SWL used within the noise model and the relevant data sheets are included within Annex 4.

Table 5.1: 1/3 Octave Band SWL, dBA used to model the HV Grid Transformer

	Frequency (Hz)								
Hz	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dBA	-	-	-	63.8	47.8	55.1	72.1	68.6	78.4
Hz	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**

	Frequency (Hz)								
dBA	74.1	76.5	80.1	77.1	77.1	79.3	78.6	76.7	74.5
Hz	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**	**6300**	**8000**	**10000**
dBA	72.4	70.2	68.5	67.6	67.0	64.9	61.9	59.8	58.2

5.2 Calculated Immission Levels

Noise immission levels have been calculated at five BESS Noise Assessment Locations (termed BNALs), which have been selected to represent the closest NSRs. The BNALs have been set on the side of the property facing the BESS compound, representing the closest point of the property's amenity area. The BNALs are detailed in Table 5.2 and shown on Figure A5.2 within Annex 5.

Table 5.2: BESS Noise Assessment Locations (BNALs)

BNAL ID	ITM X	ITM Y
BNAL1	709228	783072
BNAL2	709198	783016
BNAL3	709192	782976
BNAL4	708954	782502
BNAL5	708769	782531

The immission levels are calculated assuming all plant is operating continuously and concurrently. The levels at the BNALs are detailed in Table 5.3 as dB $L_{Aeq(t)}$ and a noise contour plot is shown as Figure A5.2. It should be noted that BS 4142 stipulates that sound levels are to be presented to the nearest whole number, and in this case, this results in the noise immissions levels being the same for all BNALs. Noise immission levels are variable between each BNAL when considering more significant figures.

In addition to the calculated levels presented in Table 5.3, levels have also been predicted for all identified NSRs and these are detailed in Annex 6 and shown on a noise contour plot as Figure A5.3.

No time period (t) is specified in the predictions as the model assumes that noise levels will not fluctuate and will remain the same for all time periods.

Table 5.3: Predicted Immission Levels, dB $L_{Aeq(t)}$

Noise Assessment Location, BNAL ID	Immission Level, dB $L_{Aeq(t)}$
BNAL1	32
BNAL2	32
BNAL3	32

Noise Assessment Location, BNAL ID	Immission Level, dB $L_{Aeq(t)}$
BNAL4	32
BNAL5	32

6 Noise Impact Assessment

6.1 Quantitative Assessment

To provide some additional context for the subsequent qualitative assessment, the immission levels are detailed in Table 6.2 against the most stringent of the guideline levels presented in BS 8233:2014.

13 dB has been added to the BS 8233 internal guideline levels to allow for the attenuation provided by a partially open window, as detailed in Table 6.1.

Table 6.1: Derived BS 8233 Fixed Level Limits

Assessment Parameter	BS 8233 Guideline Level (dB $L_{Aeq,t}$)	Allowance for Open Window Attenuation (dB $L_{Aeq,t}$)	Equivalent External Level (dB $L_{Aeq,t}$)
Daytime 07:00-23:00	35	13	48
Night-time 23:00-07:00	30	13	43

Table 6.2 below compares the predicted immission levels with the guideline levels.

Table 6.2: Quantitative Assessment

BNAL ID	Daytime		Night-time	
	Immission Level, dB $L_{Aeq(t)}$	Margin above/below guidelines, dB	Immission Level, dB $L_{Aeq(t)}$	Margin above/below guidelines, dB
BNAL1	32	-16	32	-11
BNAL2	32	-16	32	-11
BNAL3	32	-16	32	-11
BNAL4	32	-16	32	-11
BNAL5	32	-16	32	-11

As can be seen, the predictions are at 16 dB below the daytime threshold levels of BS 8233 and no significant noise impact is predicted.

6.2 Qualitative Assessment

The qualitative assessment, which is undertaken following the guidance presented in BS 4142, considers the predicted immission levels, the character of the sound, the existing sound environment and the context of the development.

In order to assess the immission levels in accordance with BS 4142, the Specific Sound Level must be converted into a Rating Level. The Rating Level allows for character corrections to be added to account for particular characteristics of the sound that may be perceived as more annoying. In particular the Rating Level considers tonality, impulsivity and intermittency of the sound, as well other sound

characteristics that are neither tonal, impulsive, or intermittent, but are otherwise readily distinctive against the residual acoustic environment.

6.2.1 Tonality

With regards to tonality, BS4142 states:

"For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible."

Some electrical plant such as power transformers are inherently tonal at source, typically in the 100 Hz frequency band, however, the BS 4142 corrections are only applied if noise characteristics are present at the receptor location. In order to determine whether tones will be present at a receptor, it is necessary to have one third octave data for all plant considered in the noise model. With the plant assumed here, one third octave band data was only available for the Inverters and the HV Transformer. For the remaining plant (BESS units and MV transformers), only octave band data was available. As such, the sound power level at 125 Hz was assumed equal to the sound power level of the one third octave band at 100 Hz. This is a cautious approach as the 100 Hz one third octave band level should be lower than the 125 Hz octave band level, as the 125 Hz octave band level is the sum of the sound power levels at 100 Hz, 125 Hz and 160 Hz. Consideration of the one third octave predicted levels does not suggest that tonality from any plant will be perceptible

For example, At BNALs 1 - 3 the maximum predicted noise immission in the 100 Hz third octave band is 23 dB, well below the night-time background sound level of 29 dB. Additionally, at BNALs 4 – 5 the maximum predicted noise immission levels in the 100 Hz third octave band is 22 dB, also below the night-time background sound level of 23 dB. As such, no tonal character correction has been applied.

6.2.2 Impulsivity

With regards to impulsivity, BS 4142 states:

"A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible."

Impulsivity is not considered to be a relevant sound characteristic of a BESS and substation as when operational, the noise level will be predictable and consistent.

6.2.3 Intermittency

The intermittency of the sound source needs to be considered when it has identifiable on/off conditions with regards to intermittency, BS4142 states:

"If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

As with impulsivity, intermittency is not considered to be a relevant sound characteristic in this case. Once operational, noise levels may fluctuate by a small amount over long periods of time, but no regular step changes in noise level are anticipated.

6.2.4 Other Sound Characteristics

With regards to other sound characteristics, BS4142 states:

"Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

Based on TNEI's understanding and experience of this type of plant, it is not anticipated that any additional sound characteristics that would be considered readily distinctive against the residual acoustic environment.

6.2.5 Calculation of the Rating Level

With due regard to the above, no character corrections are required. Therefore, the BS4142 Rating Levels are equal to the Specific Sound Levels. At all NALs the Rating Level is less than 35 dB LAeq(t), which can be classed as 'low' (see Section 3.2.1.).

6.2.6 Assessment of the Impacts

BS4142, Section 11, requires that the assessment considers the context in which the sound occurs, and as such there is no definitive pass/fail element to the standard. However, as a starting point the standard states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following…

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

Table 6.3Table 6.2 presents a comparison of the Rating Levels to the daytime and night-time background sound levels. In addition, Annex 6 present a comparison of the Rating Levels to the daytime and night-time background sound levels at all identified NSRs.

Table 6.3 Margin Above / Below (+/-) Background Sound Level, dB

Noise Assessment Location	Daytime			Night-time		
BNAL ID	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
BNAL1 (H110)	32	38	-5	32	29	+3
BNAL2 (H109)	32	38	-5	32	29	+3

Noise Assessment Location	Daytime			Night-time		
BNAL ID	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
BNAL3 (H108)	32	38	-5	32	29	+3
BNAL4 (H238)	32	35	-1	32	23	+9
BNAL5 (H374)	32	35	-1	32	23	+9

For all receptors the Rating Levels remain below the background sound levels during the daytime. This is "*an indication of the specific sound source having a low impact, depending on the context.*"

The Rating Level exceeds the night-time background sound level by +3 dB at BNALs 1 - 3, which is below the level that is "*indication of an adverse impact, depending on the context",* and by +9 dB at BNALs 4 – 5, which is below the level that is "*indication of a significant adverse impact, depending on the context.*"

The context in which the assessment is made is as follows;

- The primary noise generation mechanism for all plant associated with this development is related to cooling. The noise model assumes all cooling plant for batteries, inverters and transformers is operating at maximum noise level output, however, this will only occur when ambient temperatures are high or the equipment is under full load. For much of the time cooling equipment will be operating at lower capacities and overall sound output will be reduced.
- Similarly, the noise model assumes all plant is operating concurrently, however not all cooling (or heating) units will necessarily be required to operate at the same time and as such, overall noise levels are likely to be lower than predicted.

With due regards to the above context of the development, the outcome of the BS 4142 assessment at all BNALs during the daytime and BNALs 1 – 3 during the night time remains unchanged, and no adverse impact is expected at these receptors.

For BNALs 4 – 5 during the night time, the Rating Levels are classed as 'low' i.e. below 35 dB LAeq(t) and the background sound levels at night are classed as 'very low' (below 30 dB LA90(10mins)). In this situation BS 4142 states that the "*absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night*". The absolute levels will remain well below the fixed guideline values as detailed in BS 8233 for all receptors and for all time periods.

An analysis of the measured $L_{Aeq,t}$ values at NML3 (representative of BNALs 4 – 5) shows the residual night-time levels to be 30 dB(A) (based on the calculated mean of all assessed 10 minute periods). The

resulting ambient sound level during the night-time at BNALs 4 and 5 (32 dB(A) + 30 dB(A)) is 4 dB(A). For context, a change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear and is considered *'just perceptible'* [1]. With due regard to the context, in particular that the ambient sound level would still be classed as 'low', the outcome of the BS 4142 assessment is that the Proposed Project is not expected to have an adverse impact in terms of noise resulting from the BESS at BNALs 4 -5 during the night time.

With due regard to the above context, the outcome of the BS 4142 assessment is that the Proposed Project is not expected to have an adverse impact in terms of noise resulting from the BESS.

7 Summary

In order to assess the impact of noise emissions from the proposed BESS within the proposed Kellystown Wind Farm, TNEI has produced a noise propagation model in accordance with ISO 9613 that predicts the noise immission levels at the nearest identified residential receptors. Predictions are based on an indicative layout and candidate plant that is typical for this type and class of BESS development.

A small number of residential properties were identified and assessed as part of the main assessment presented within this report, the nearest of which are approximately 300 m to the east and 450 m to the south of the proposed BESS. Additional residential receptors within a 2 km study area were also considered, and these are detailed in Annex 5.

Two assessments considering the nearest residential NSRs have been carried out;

- A quantitative assessment has concluded that levels would remain below the fixed guideline levels detailed in BS 8233 for the daytime and night-time assessment periods.
- A qualitative assessment was undertaken in accordance with BS 4142. This assessment concluded that for all BNALs during the daytime "*the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*"
- At BNALs 1 - 3 the Rating Level exceeds the background sound level during the night-time by +3 dB which is below the level that is an "*indication of an adverse impact, depending on the context.*" At BNALs 4 - 5 the Rating Level exceeds the background sound level during the night-time by +9 dB which is around the level that is an "*indication of a significant adverse impact, depending on the context.*" After consideration of the context, namely the ambient sound level would still be classed as 'low', the assessment concludes that there is no indication of an adverse impact at the receptors.

Accordingly, the Noise Impact Assessment concludes that the Proposed BESS Development will not have an adverse noise impact on the local area.

8 References

1. **Association of Acoustic Consultants of Ireland.** *Environmental Noise Guidance for Local Authority Planning & Enforcement Departments.* s.l. : AACI, 2021.

2. **British Standards Institute.** *Methods for Rating and Assessing Industrial and Commercial Sound.* UK : BSI, 2014. BS4142:2014 + A1:2019.

3. —. *Guidance on Sound Insulation and Noise Reduction for Buildings.* UK : BSI, 2014. BS8233:2014.

4. **Association of Noise Consultants.** *ANC Good Practice Working Group, BS 4142:2014+A1:2019 Technical Note. s.1.* 2020.

5. —. *Acoustics Ventilation and Overheating (AVO) Residential Design Guide.* 2020.

6. **(ISO), International Organization for Standardization.** *Acoustics – Attenuation of Sound During Propagation Outdoors: Part 2 – General Method of Calculation.* Geneva : (ISO), International Organization for Standardization, 1996. ISO 9613-2:1996.

7. **Commission Electrotechnique Internationale (IEC).** *Electroacoustics - Sound level meters - Part 1: Specifications.* Geneva : IEC, 2013. IEC 61672-1:2013.

Annex 1 – Glossary of Terms

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 Sound Level: the sound level rarely fallen below in any given location over any given time period, often classed according to daytime, evening or night-time periods. The LA90 indices (see below) are typically used to represent the background sound level.

Broadband Noise: noise with components over a wide range of frequencies.

Decibel (dB): the ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. A logarithmic scale is used in sound level measurements because of this wide range. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound level.

dB(A): the ear has the ability to recognise a particular sound depending on its pitch or frequency. Microphones cannot differentiate sound in the same way as the ear, and to counter this weakness the sound measuring instrument applies a correction to correspond more closely to the frequency response of the human ear. The correction factor is called 'A Weighting' and the resulting measurements are written as dB(A). The dB(A) weighting is internationally accepted and has been found to correspond well with people's subjective reaction to sound levels and noise. Some typical subjective changes in sound levels are:

- a change of 3 dB(A) is just perceptible;
- a change of 5 dB(A) is clearly perceptible; and
- a change of 10 dB(A) is twice (or half) as loud.

Directivity: the property of a sound source that causes more sound to be radiated in one direction than another.

Emission: the sound energy emitted by a sound source (e.g. a wind turbine).

Frequency: the pitch of a sound in Hz or kHz. See Hertz.

Ground Effects: the modification of sound at a receiver location due to the interaction of the sound waves with the ground along its propagation path from source to receiver. Described using the term 'G', and ranges between 0 (hard ground), 0.5 (mixed ground) and 1 (soft ground).

Hertz (Hz): sound frequency refers to how quickly the air vibrates, or how close the sound waves are to each other (in cycles per second, or Hertz (Hz)).

Immission: the sound pressure level detected at a given location (e.g. the nearest dwelling).

Isopleth: a line on a map connecting points of equal value, for example air pressure, noise level etc.

Noise: unwanted sound.

L_w: is the sound power level. It is a measure of the total sound energy radiated by a sound source and is used to calculate sound levels at a distant location. The L_{WA} is the A - weighted sound power level.

L_{eq}: is the equivalent continuous sound level, and is the sound level of a steady sound with the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. The $L_{Aeq,T}$ is the A - weighted equivalent continuous sound level over a given time period (T).

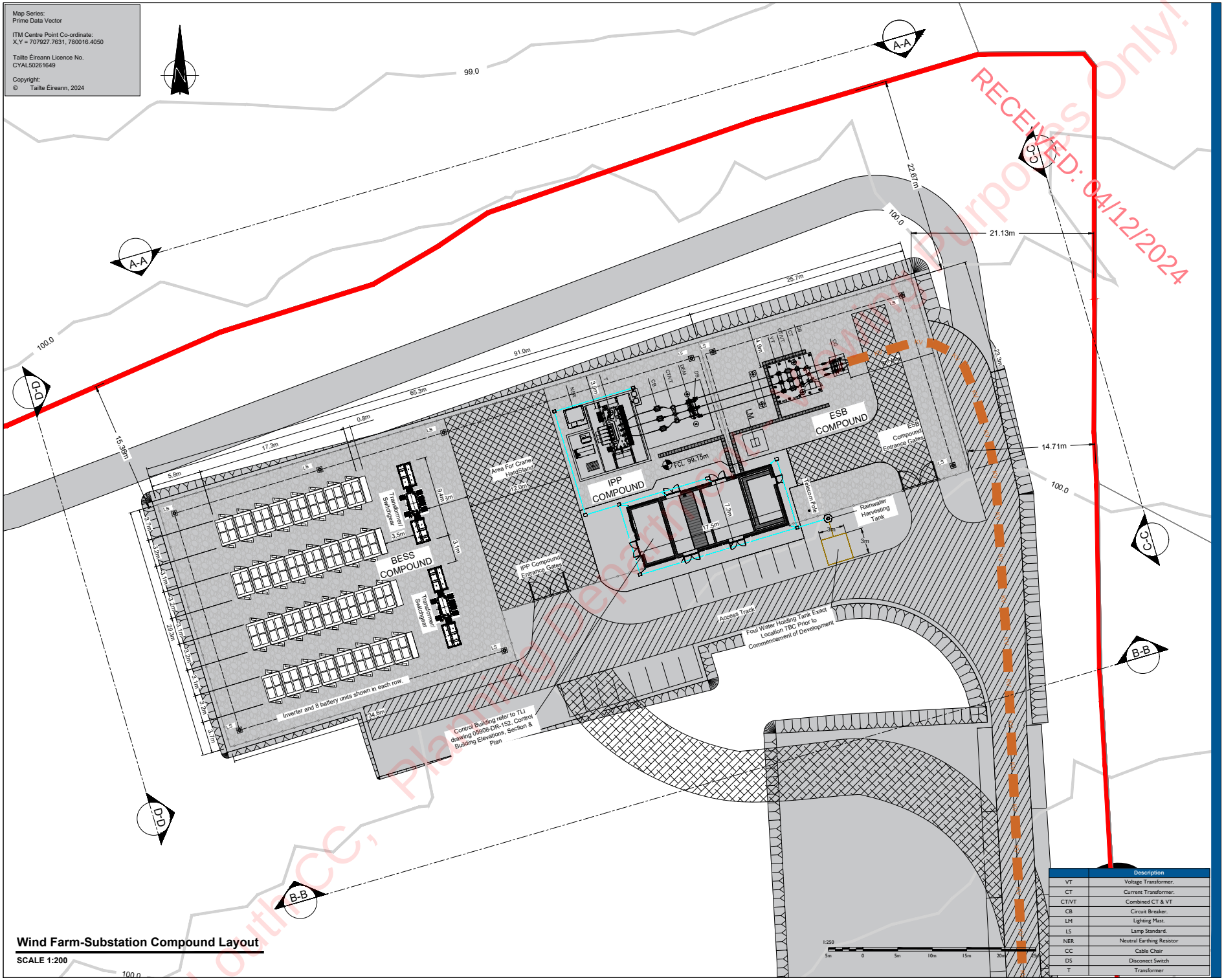
L_{90}: index represents the sound level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is often used to measure the background sound level. The $L_{A90,10min}$ is the A - weighted background sound level over a ten-minute measurement sample.

Sound Level Meter: an instrument for measuring sound pressure level.

Sound Pressure Level: a measure of the sound pressure at a point, in decibels.

Tonal Noise: noise which covers a very restricted range of frequencies (e.g. a range of ≤20 Hz). This noise is subjectively more annoying than broadband noise.

Annex 2– Development Information



Wind Farm-Substation Compound Layout

SCALE 1:200

tli GROUP

Head Office
Beenreigh,
Abbeydorney,
Tralee, Co. Kerry
Ireland
Tel: 00353 66 7135710

Regional Office
Basepoint Business Centre
Stroudley Road, Basingstoke,
Hampshire,
RG24 8UP, UK
Tel: 00 44 1256406664

PROJECT

Kellystown Wind Farm
38kV Grid Connection

CLIENT

edf renewables

CONSULTANTS

JENNINGS O'DONOVAN CONSULTING ENGINEERS

NOTES: -

- Configuration of substation equipment and infrastructure is subject to detailed design and ESB design approval.
- The proposed substation layout should be used for planning purposes only.
- This drawing is to be read in conjunction with relevant drawings, specifications and reports.
- Dimensions are in millimeters, unless noted otherwise.
- Drawings are not to be scaled use figured dimensions only.

LEGEND: -

- Surface water drainage shown thus
- Planning Application Boundary
- Lamp Standard shown thus
- Proposed Levels shown thus (Planning) FCL 34.65m
- Proposed UGC Route
- Contours
- Access track
- Tempory Access track
- Wind Farm Layout

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P1	24.05.24	Issued for Planning

PROJECT NUMBER

05-949

SHEET TITLE

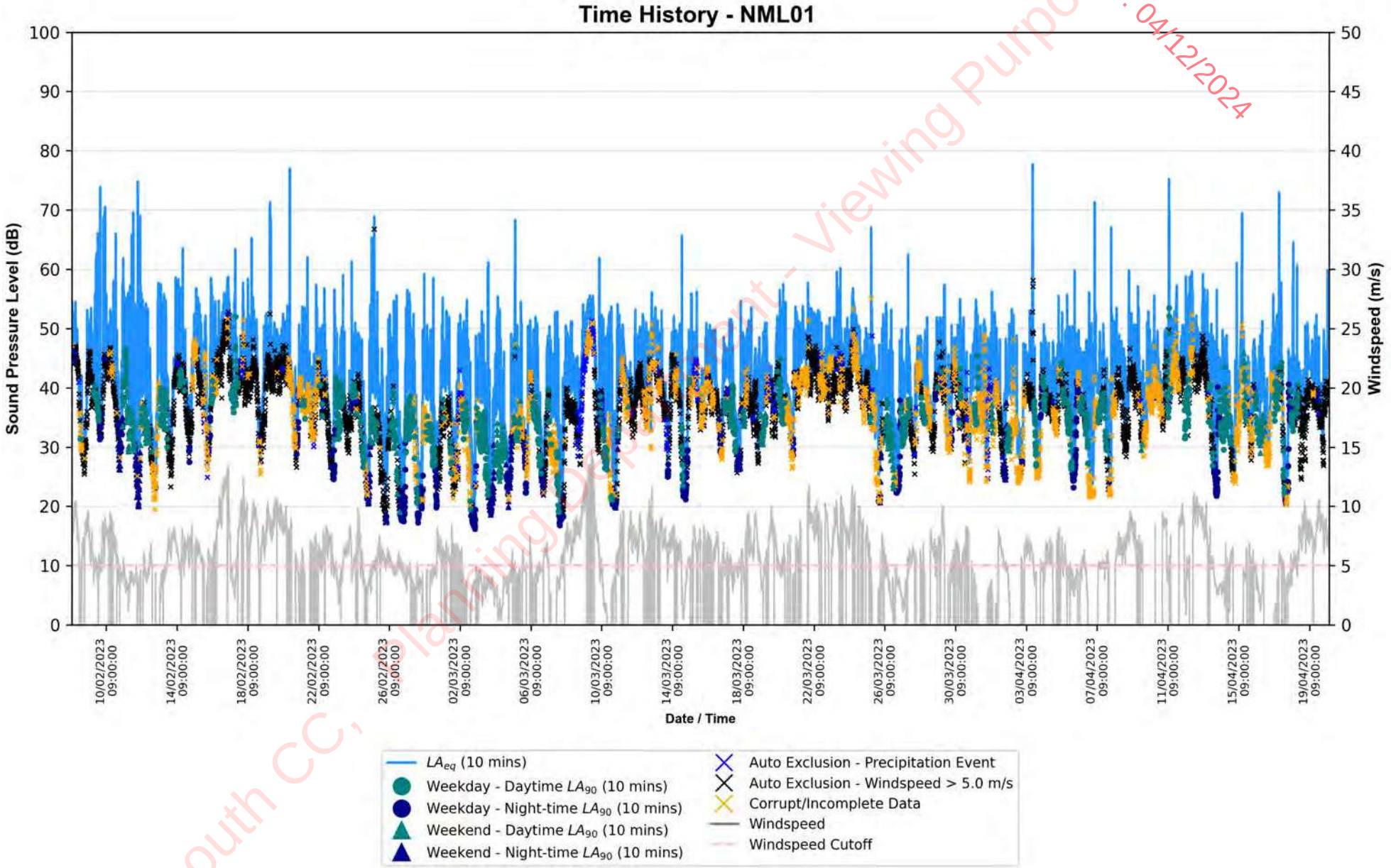
38kV Substation Compound Layout

SHEET NUMBER

05949-DR-125

Annex 3 - Baseline Survey Data

IE00125 - Kellystown - Measured Sound Levels:



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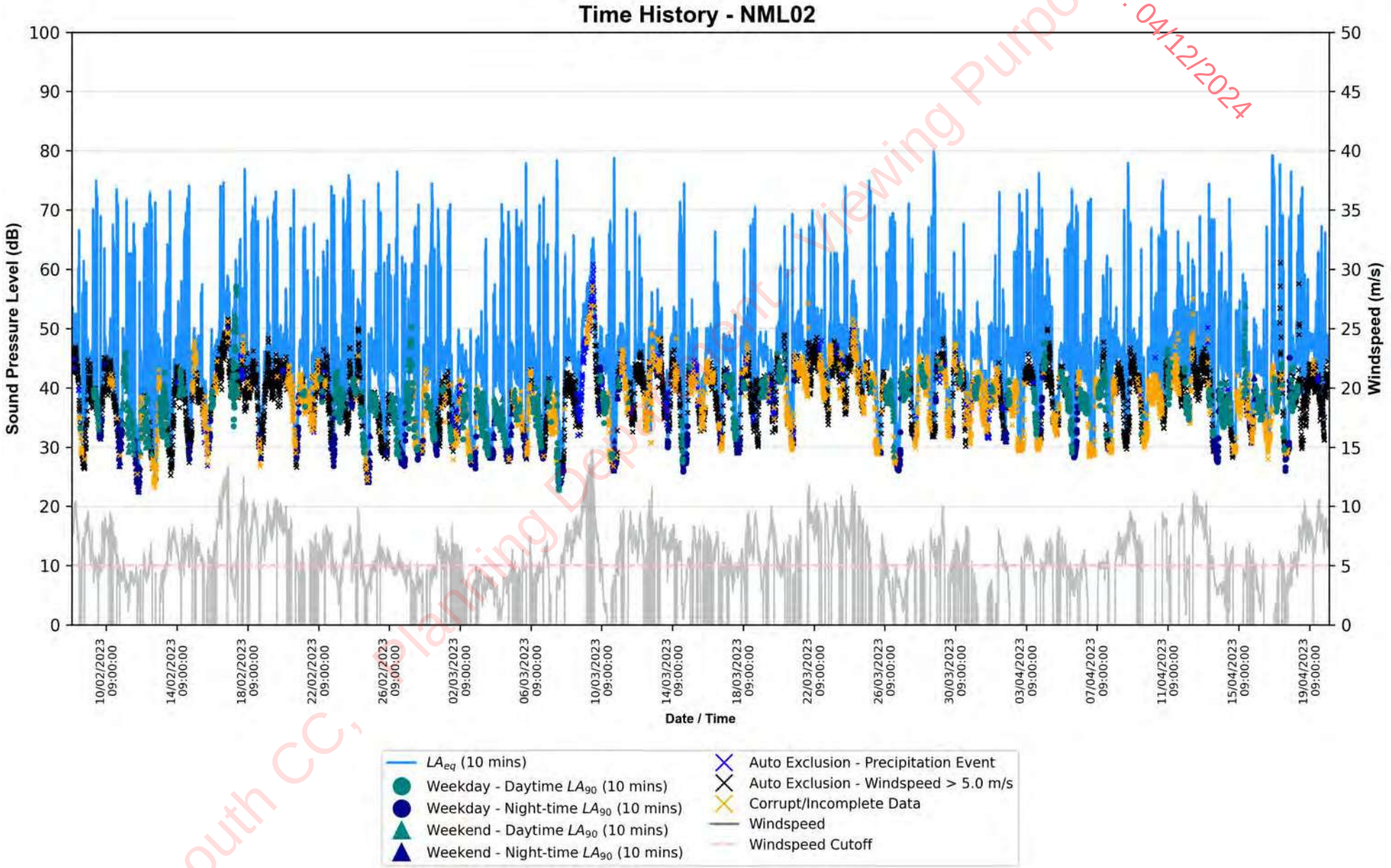

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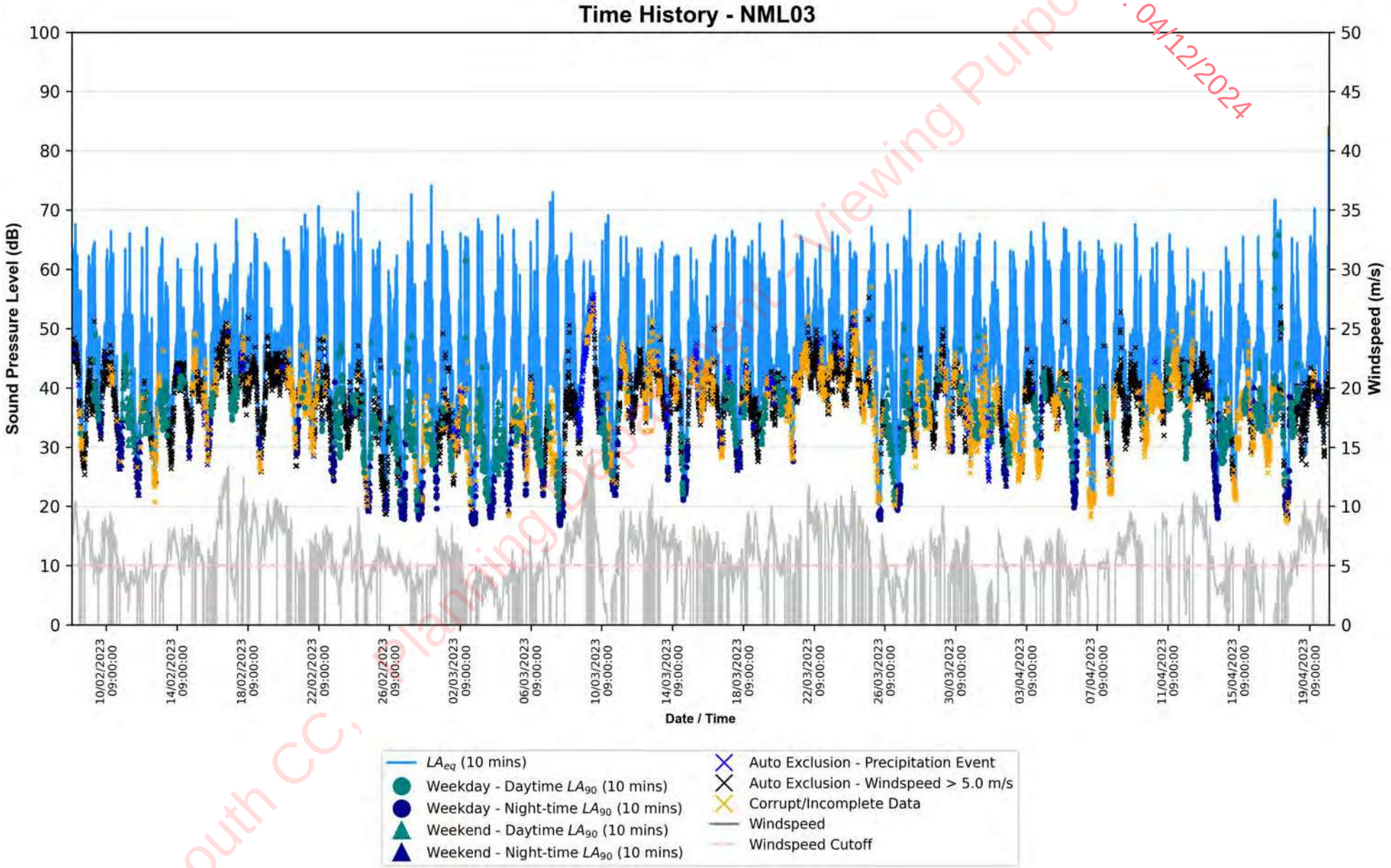

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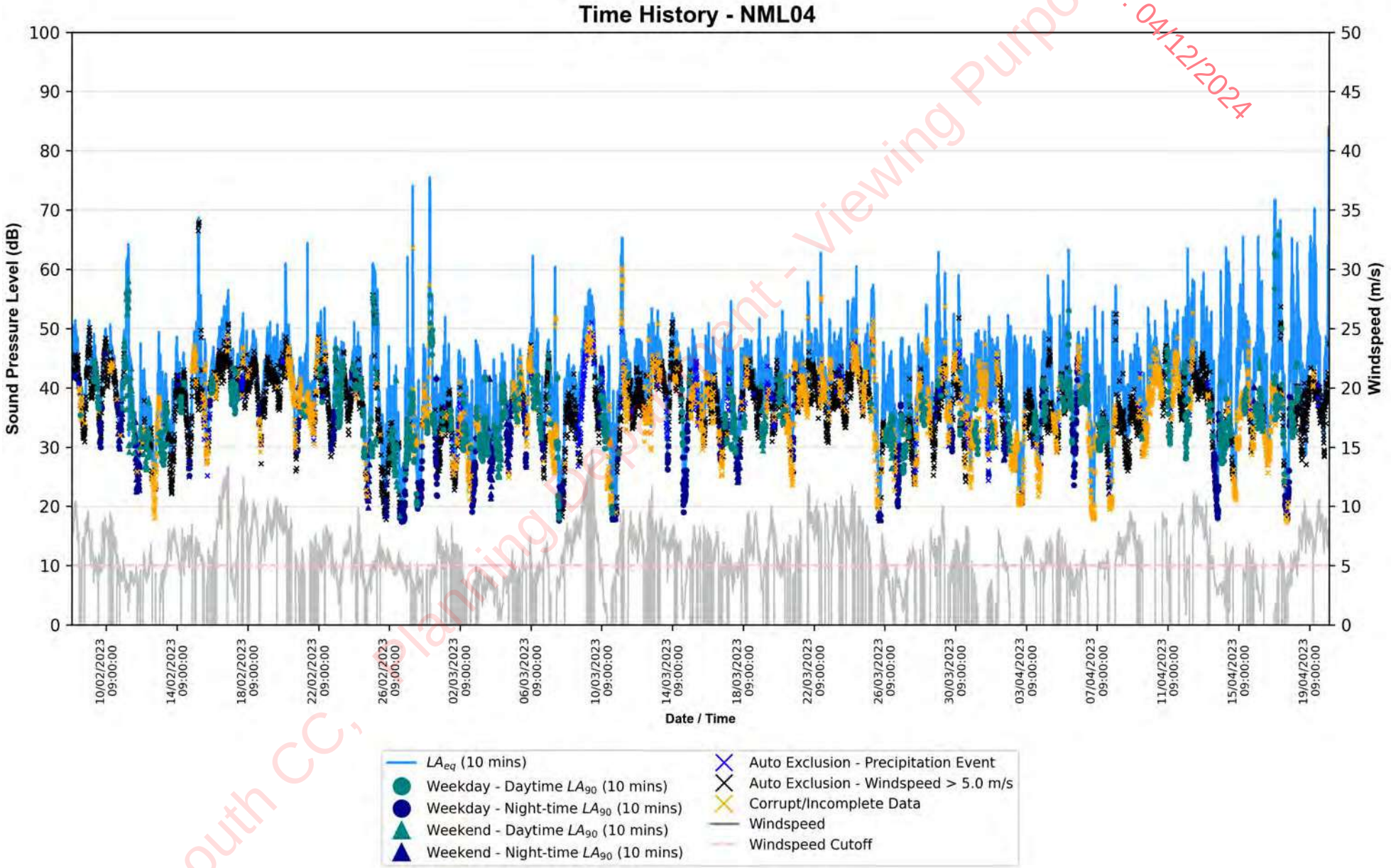

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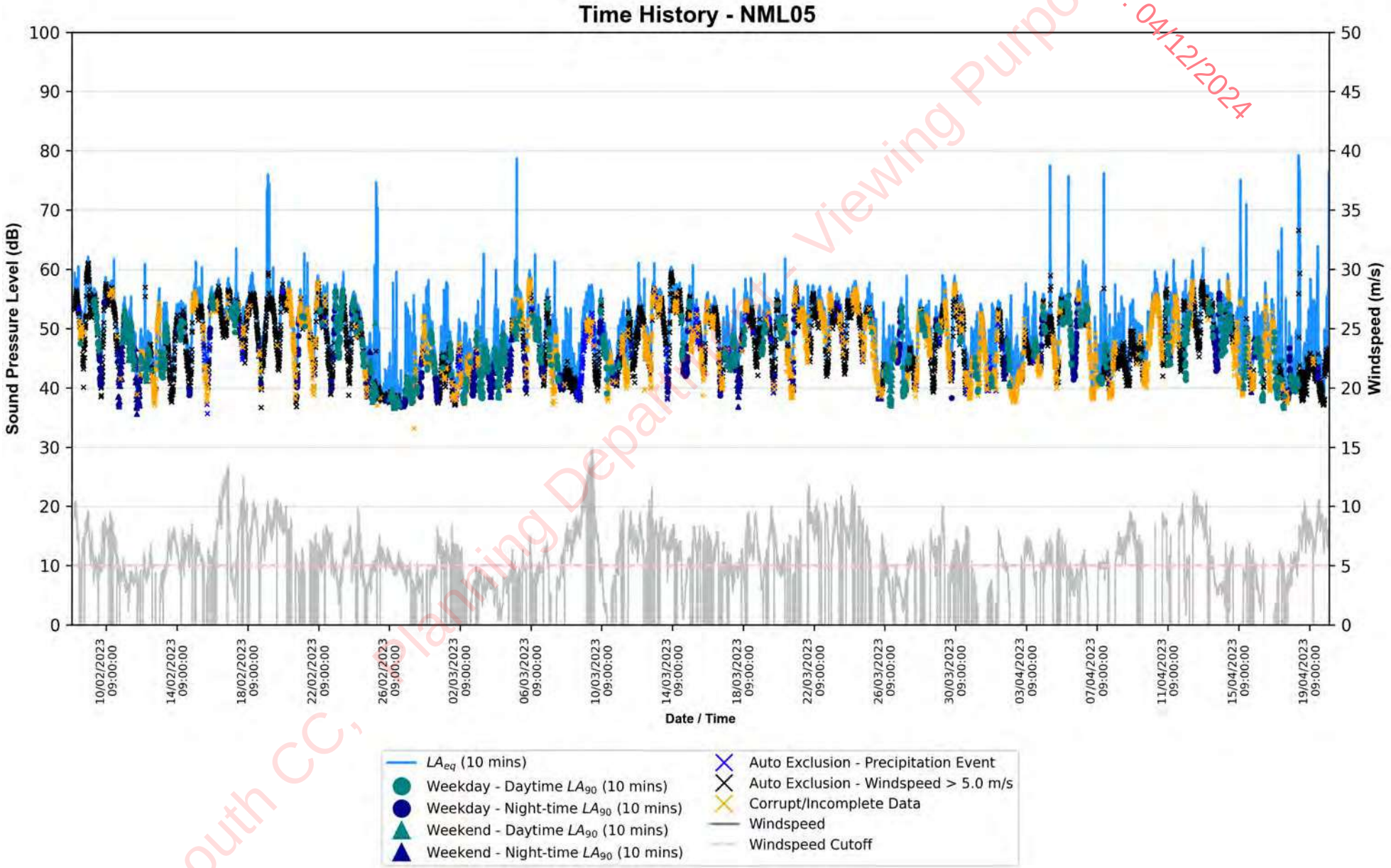

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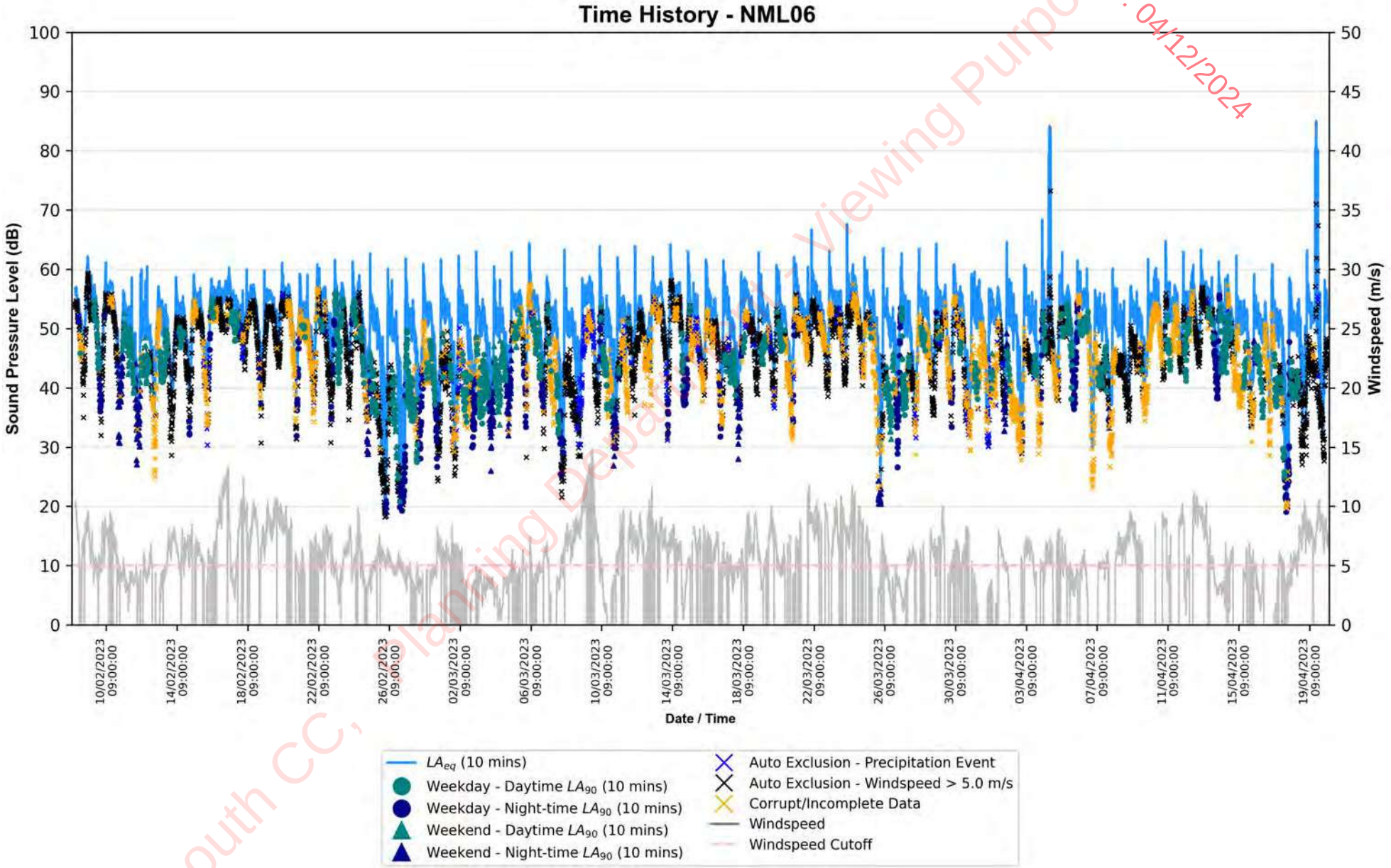

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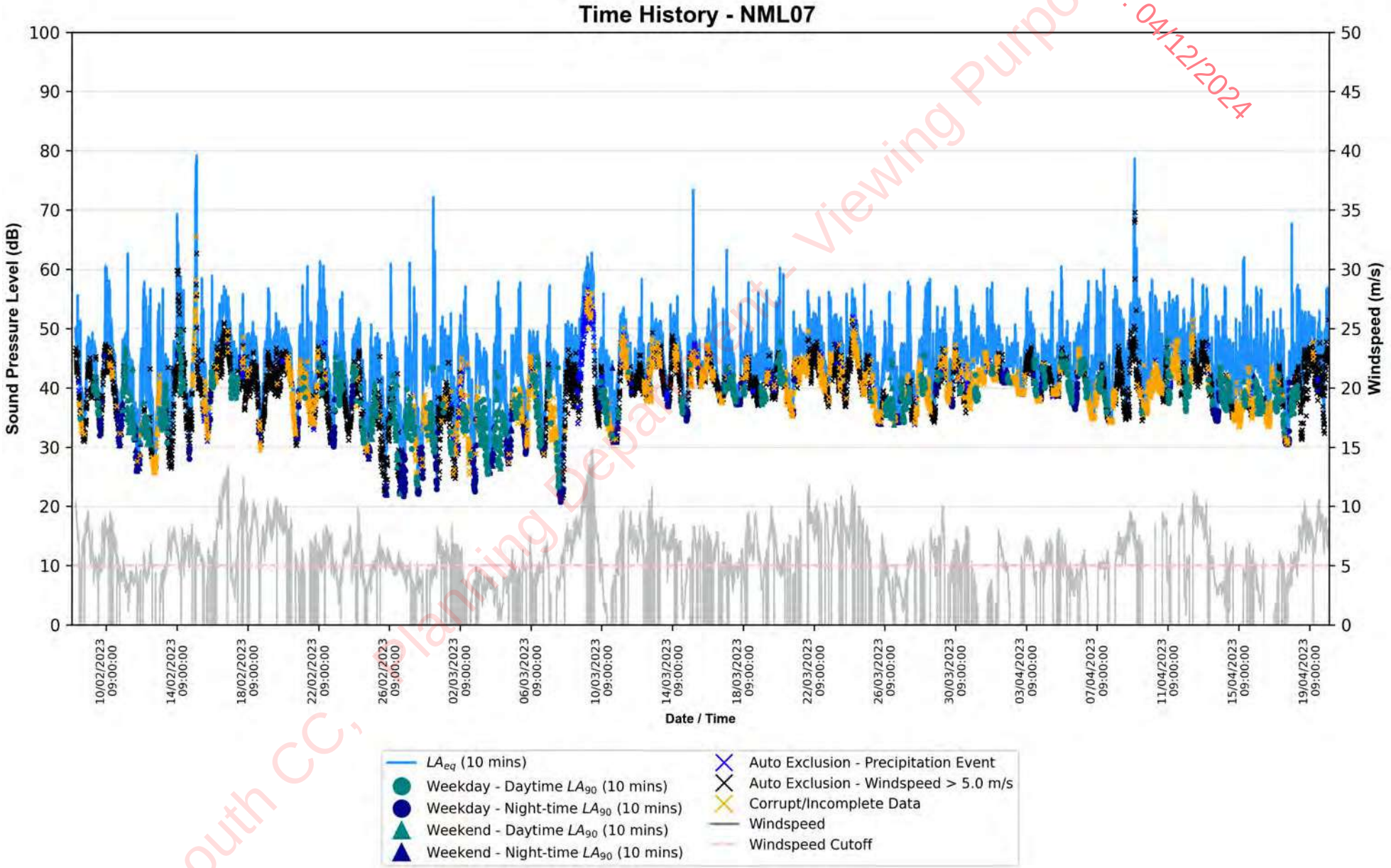

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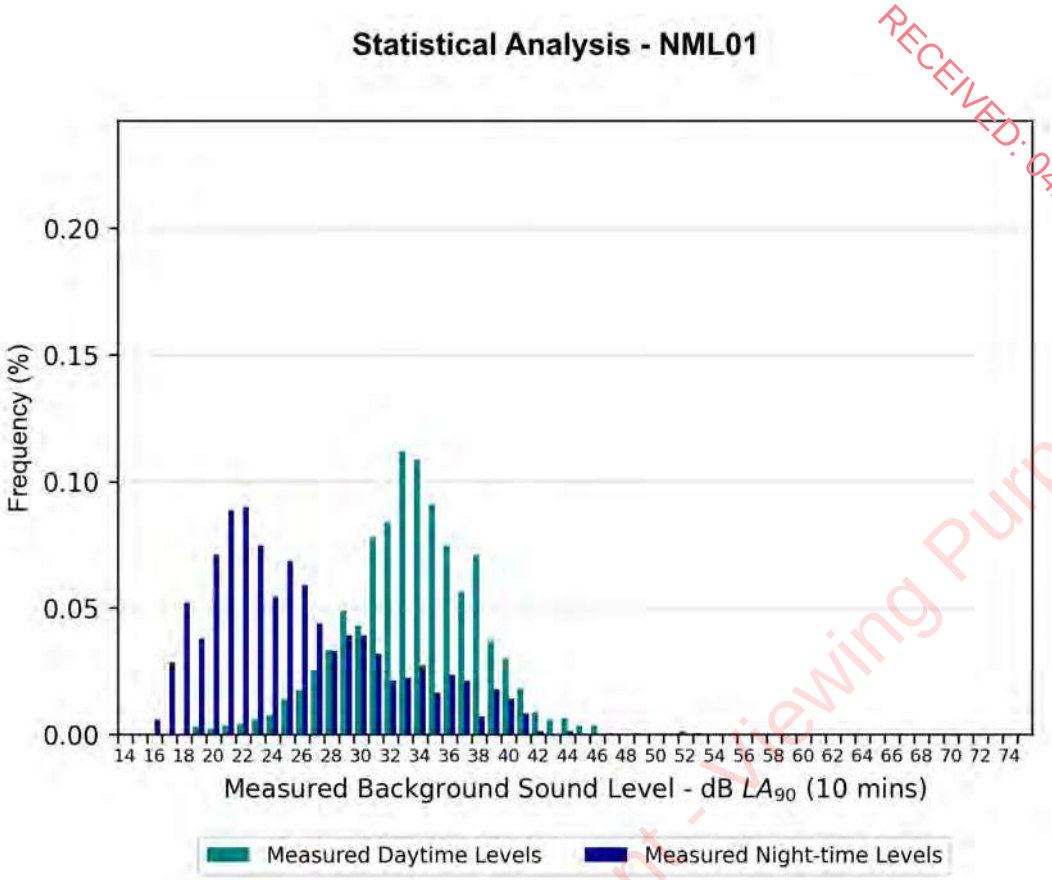

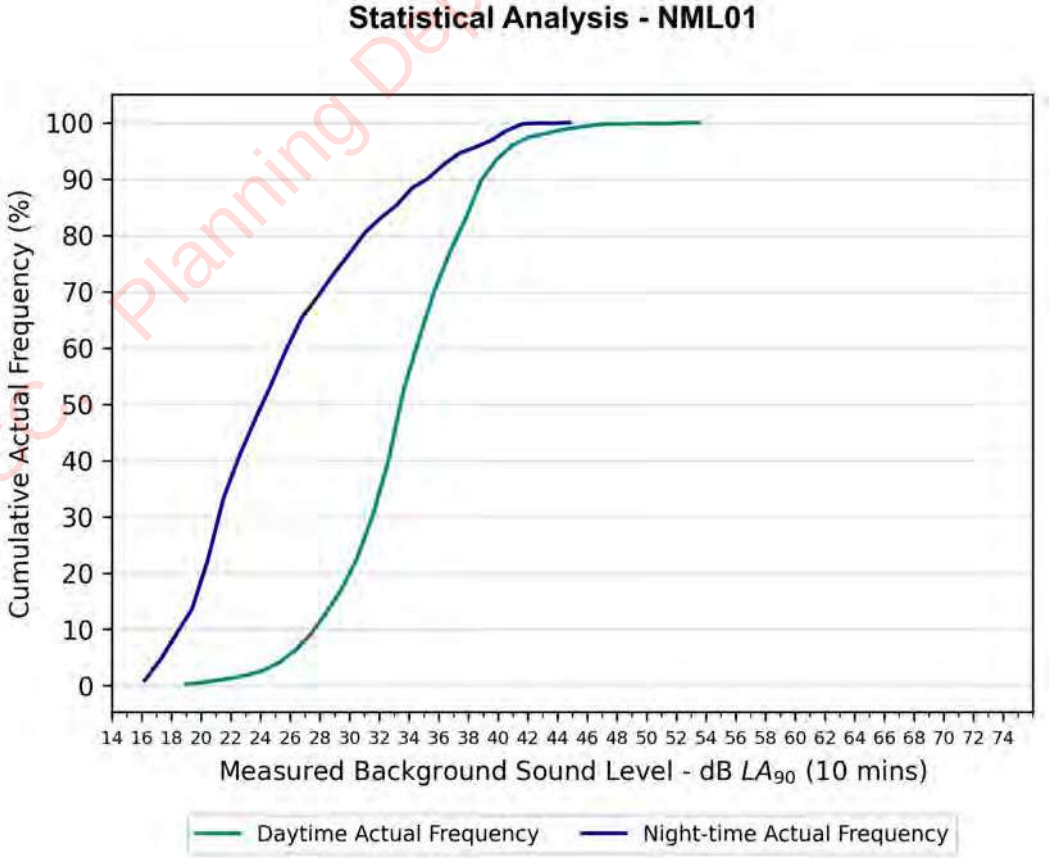

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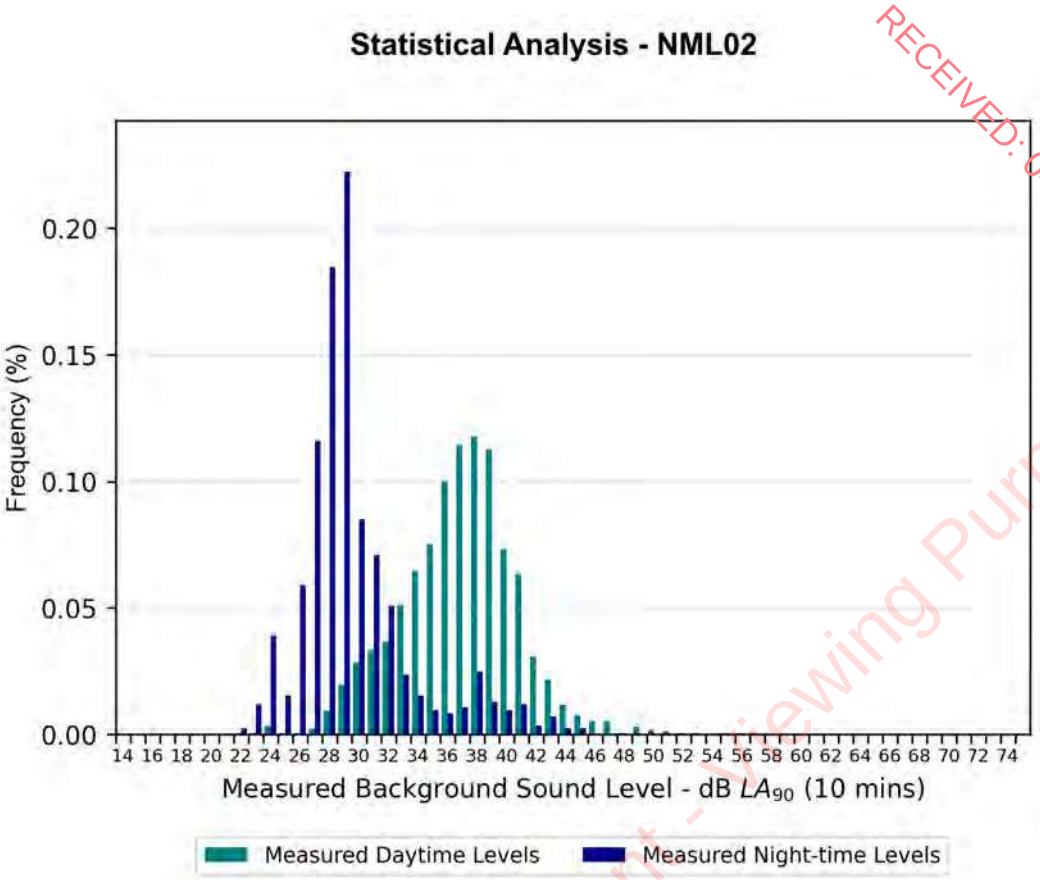

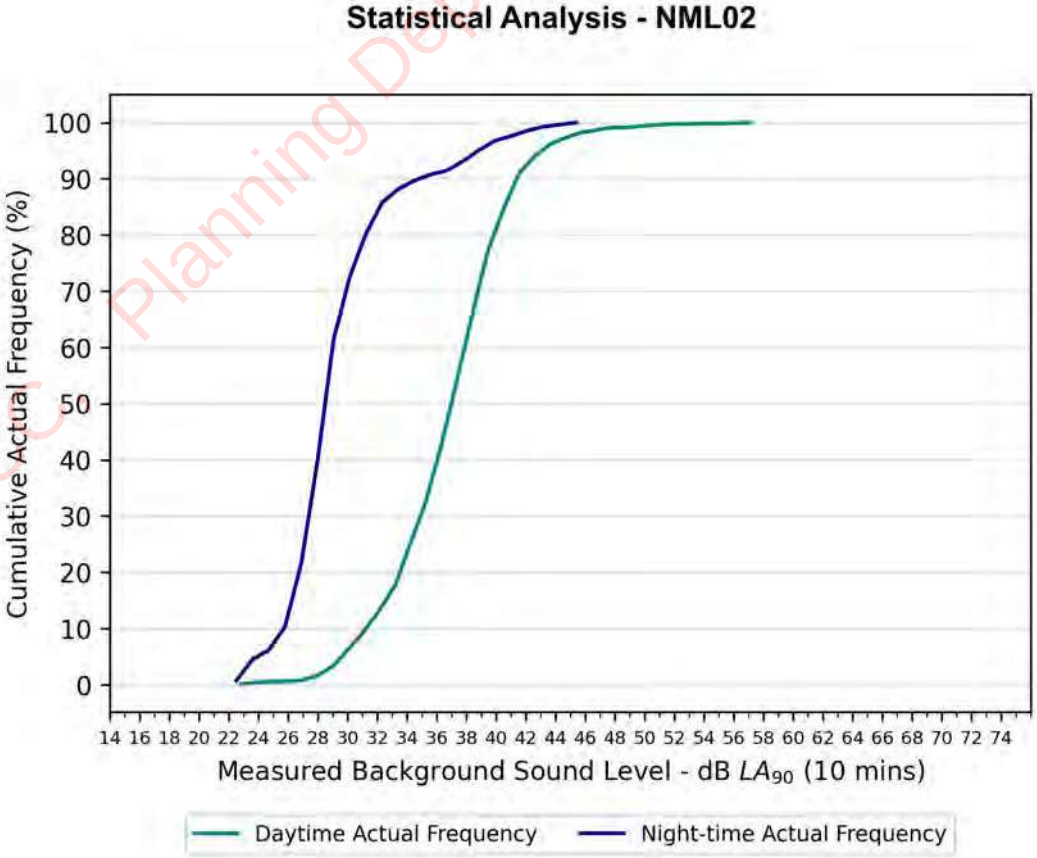

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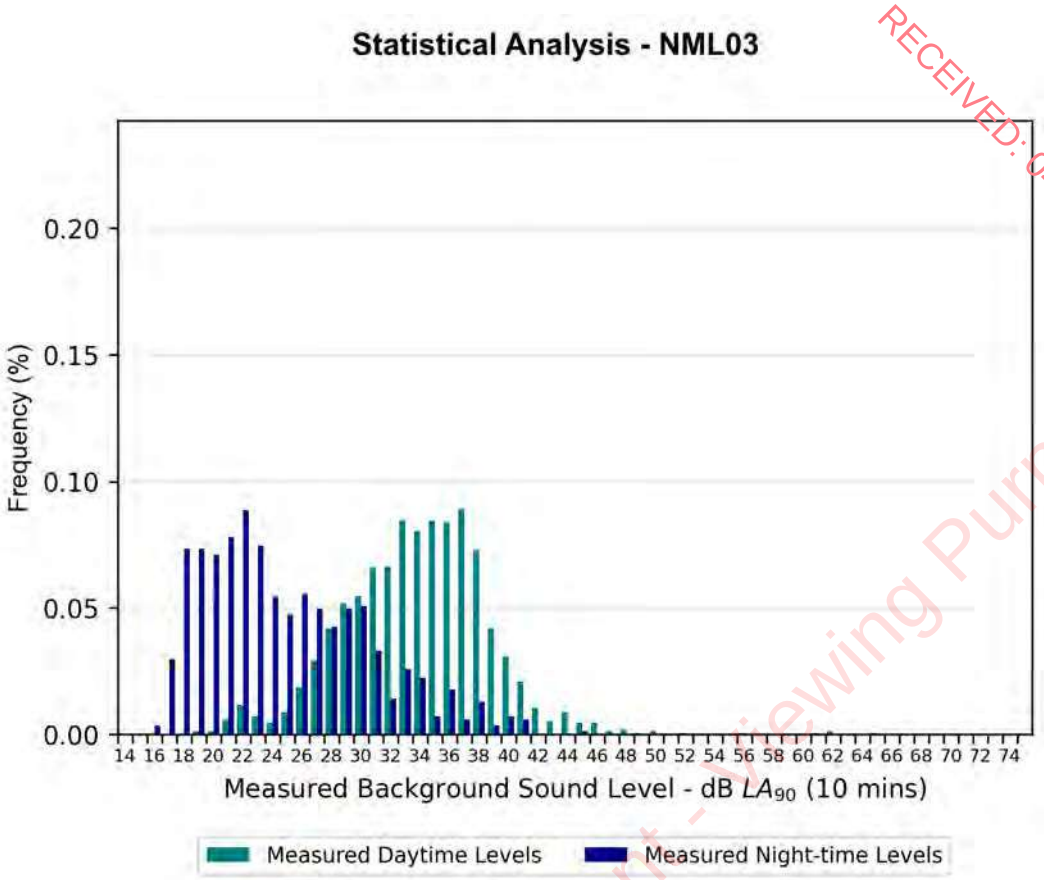

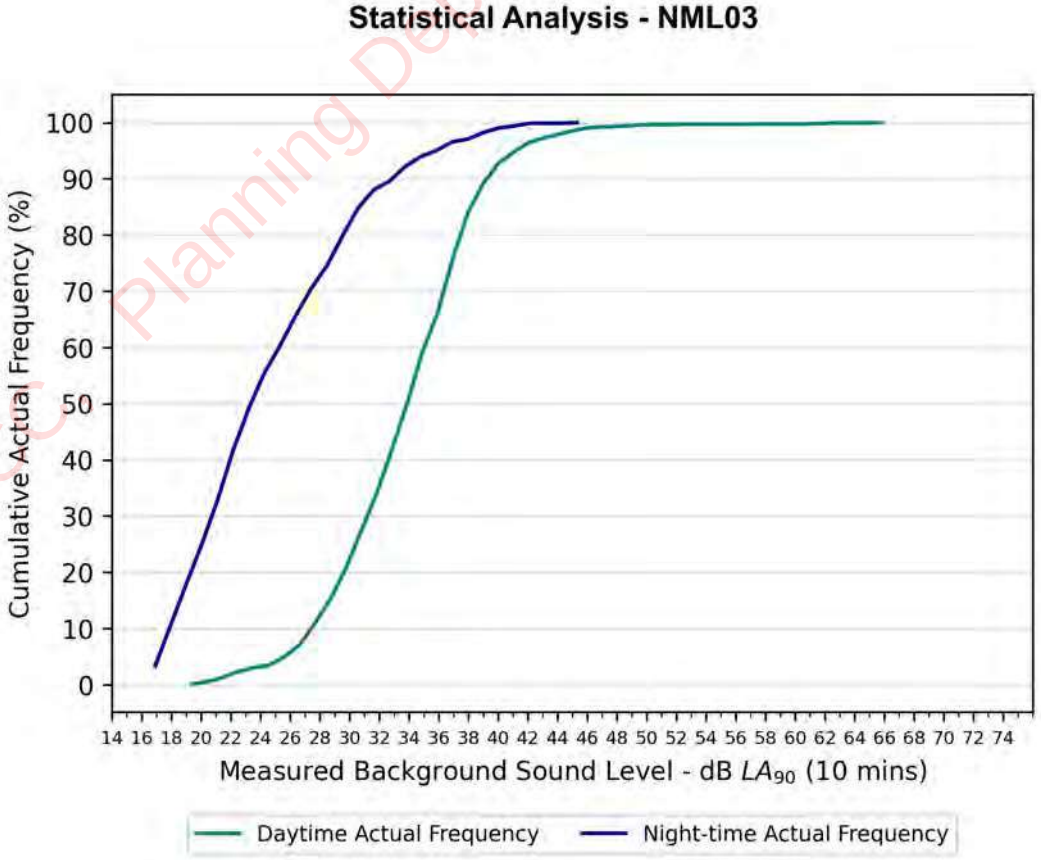

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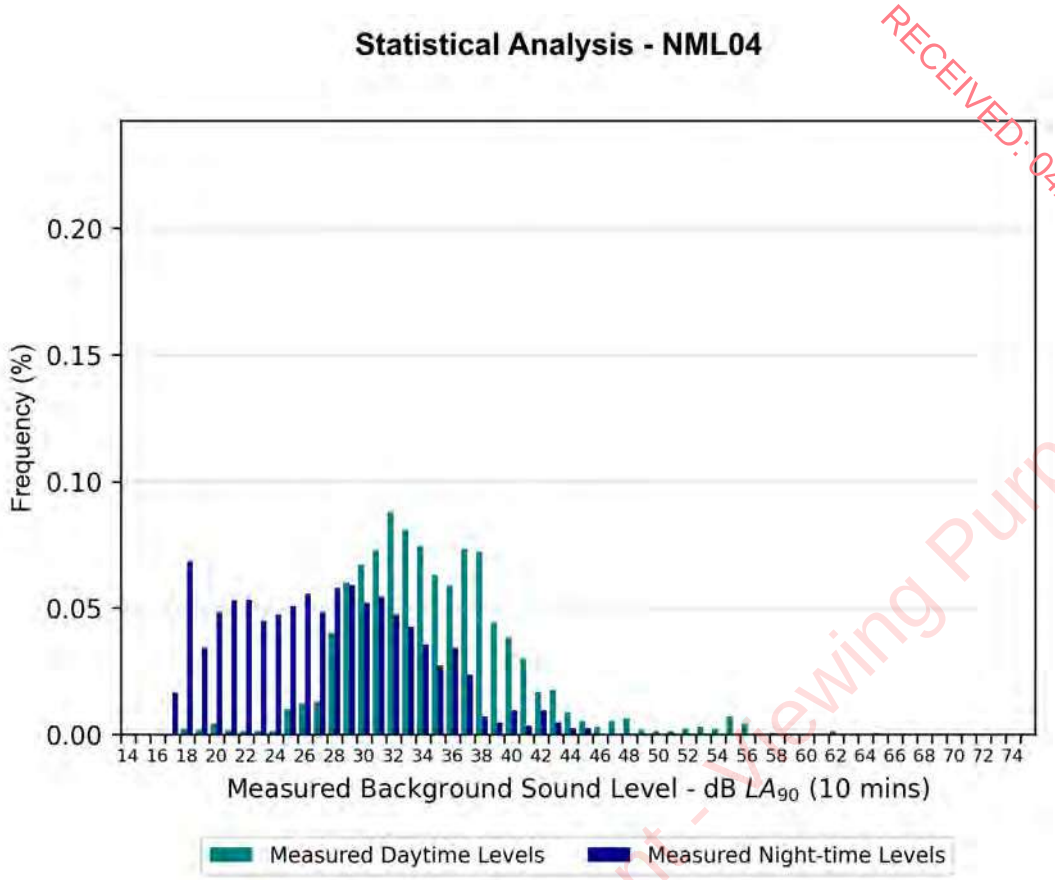

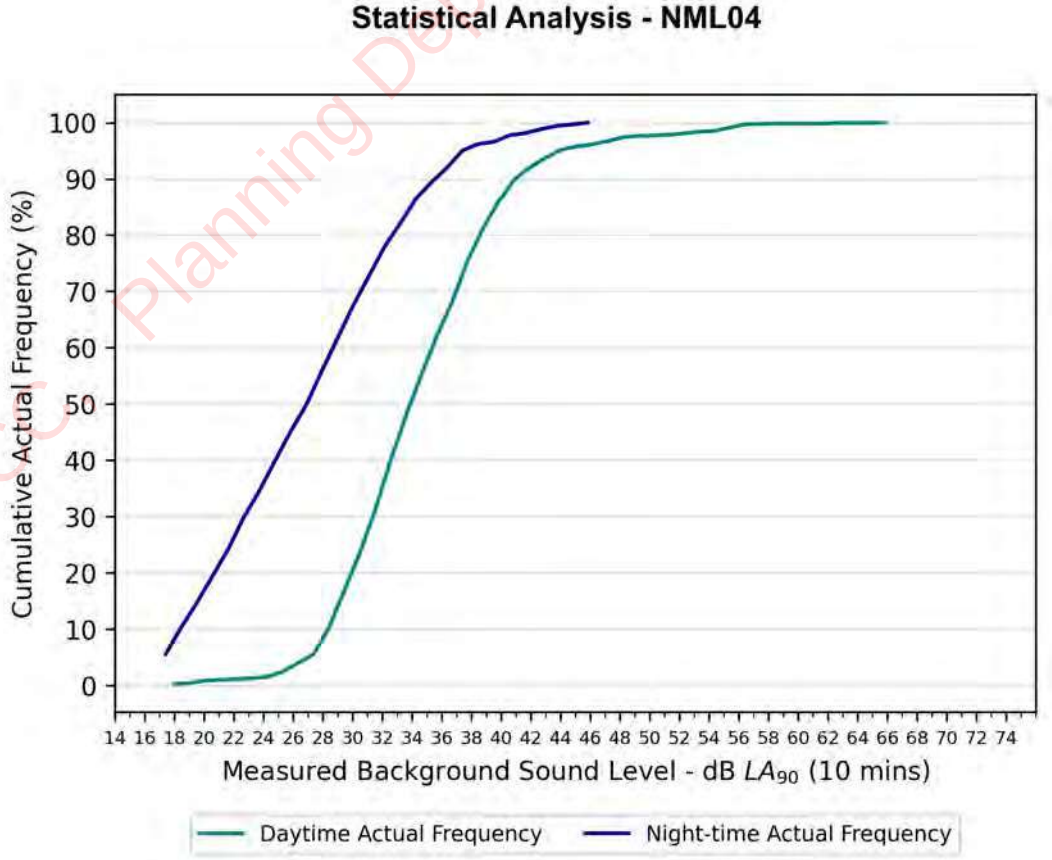

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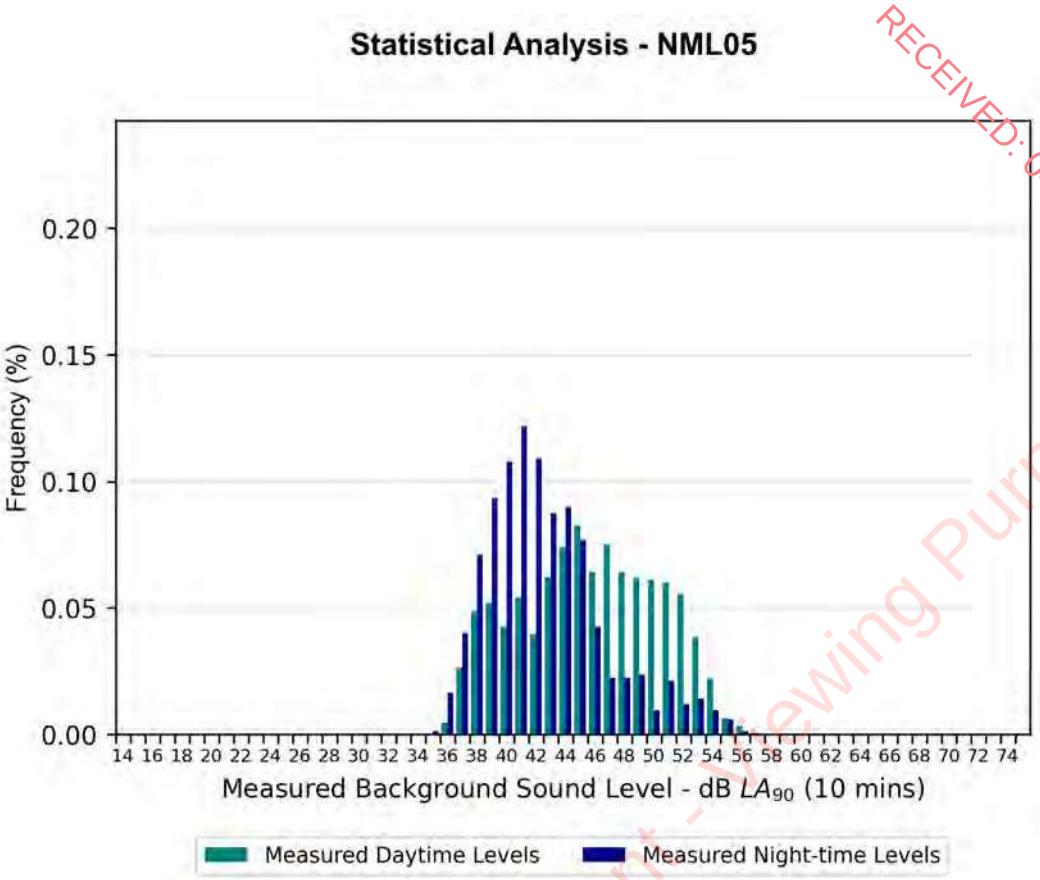

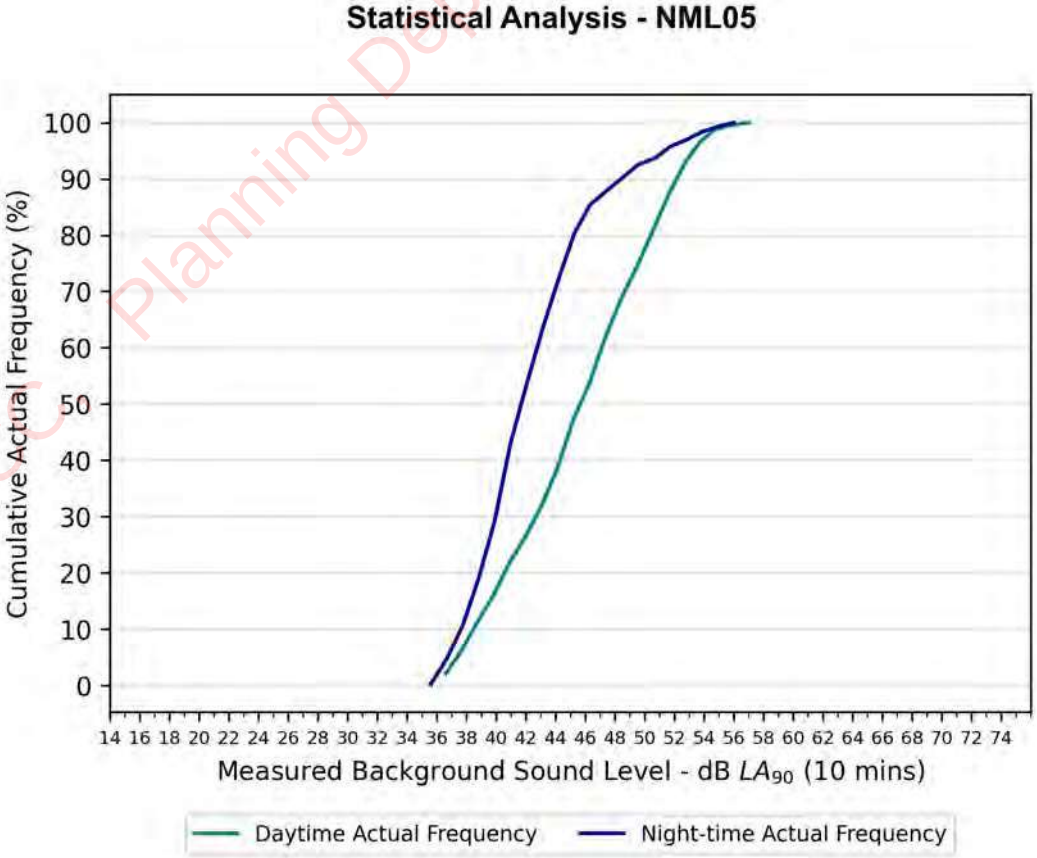

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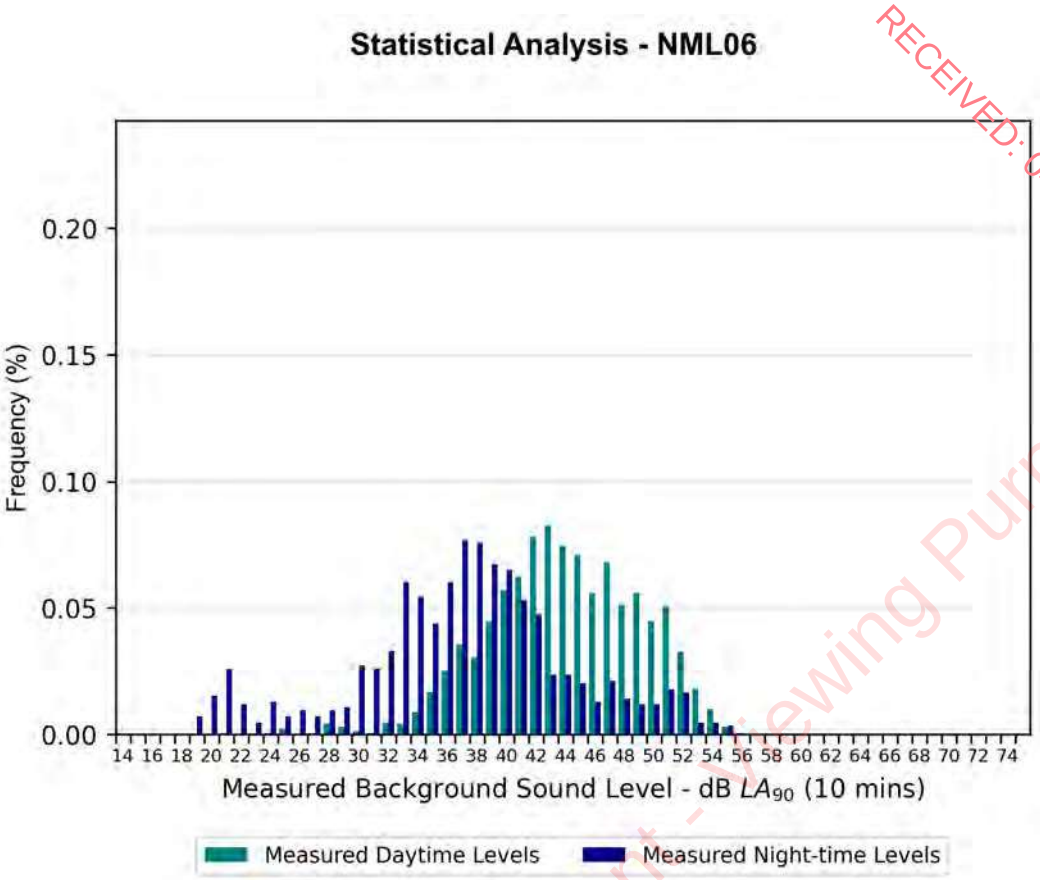

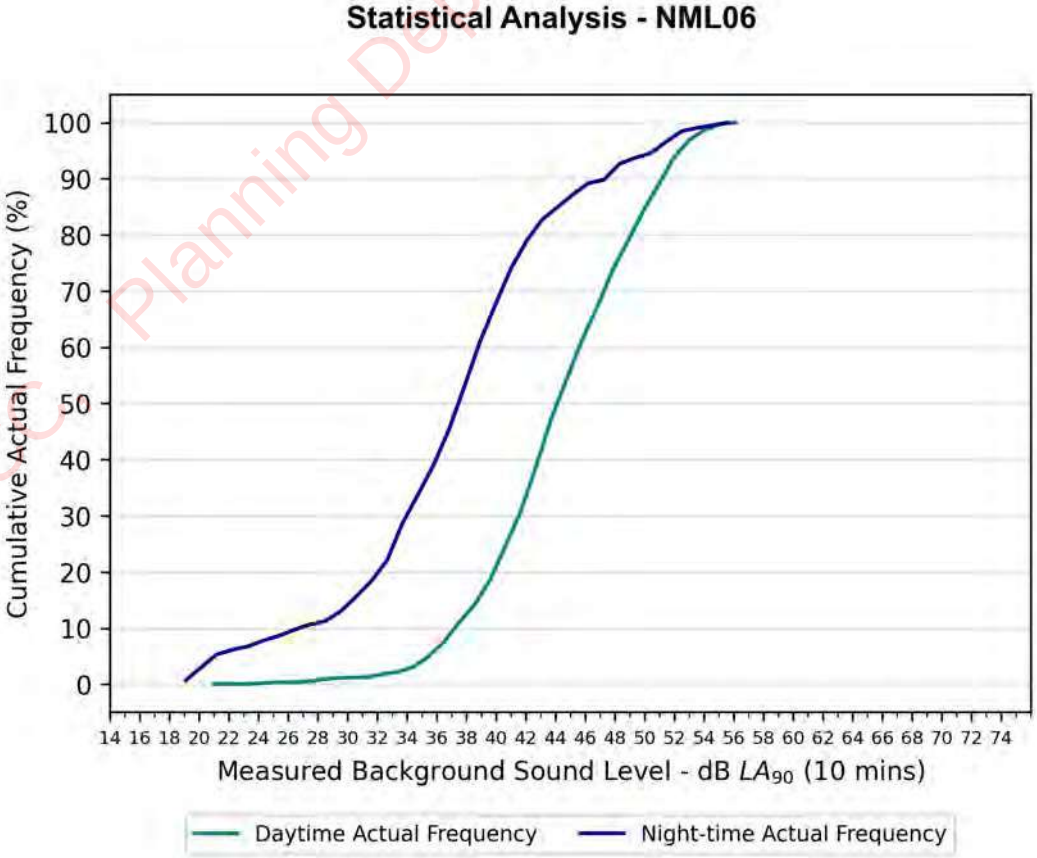

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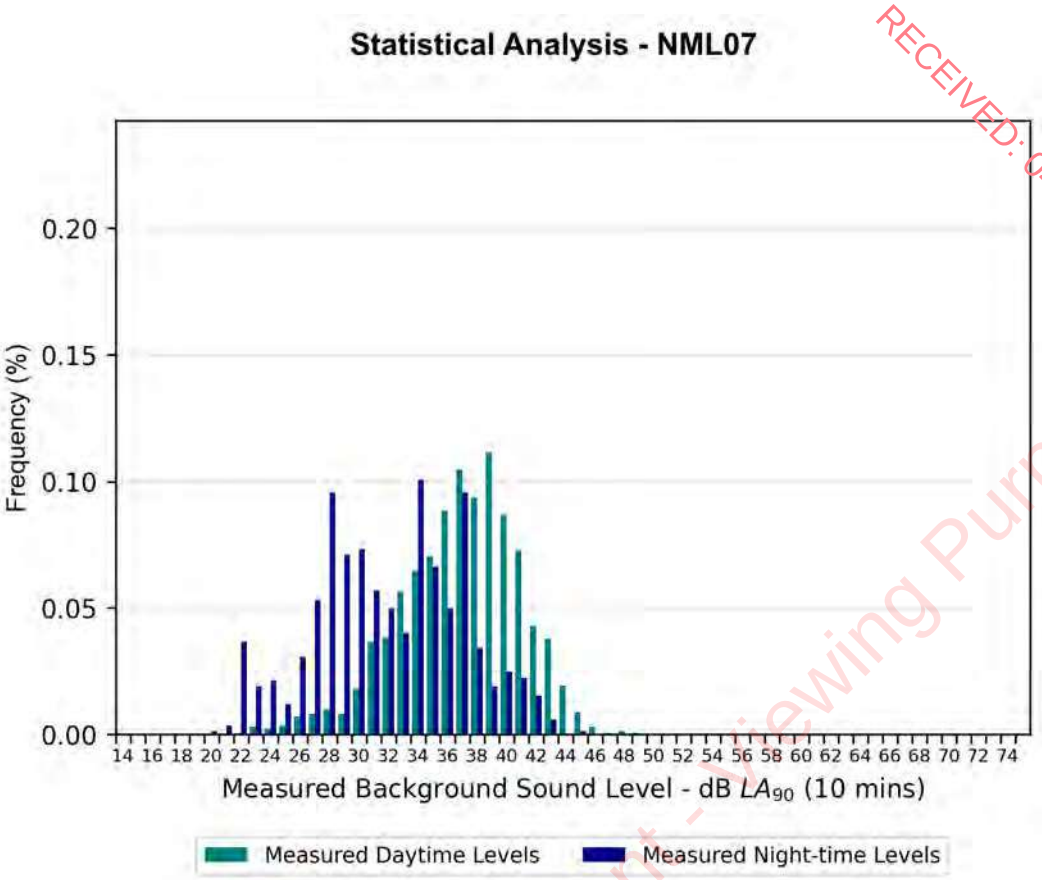
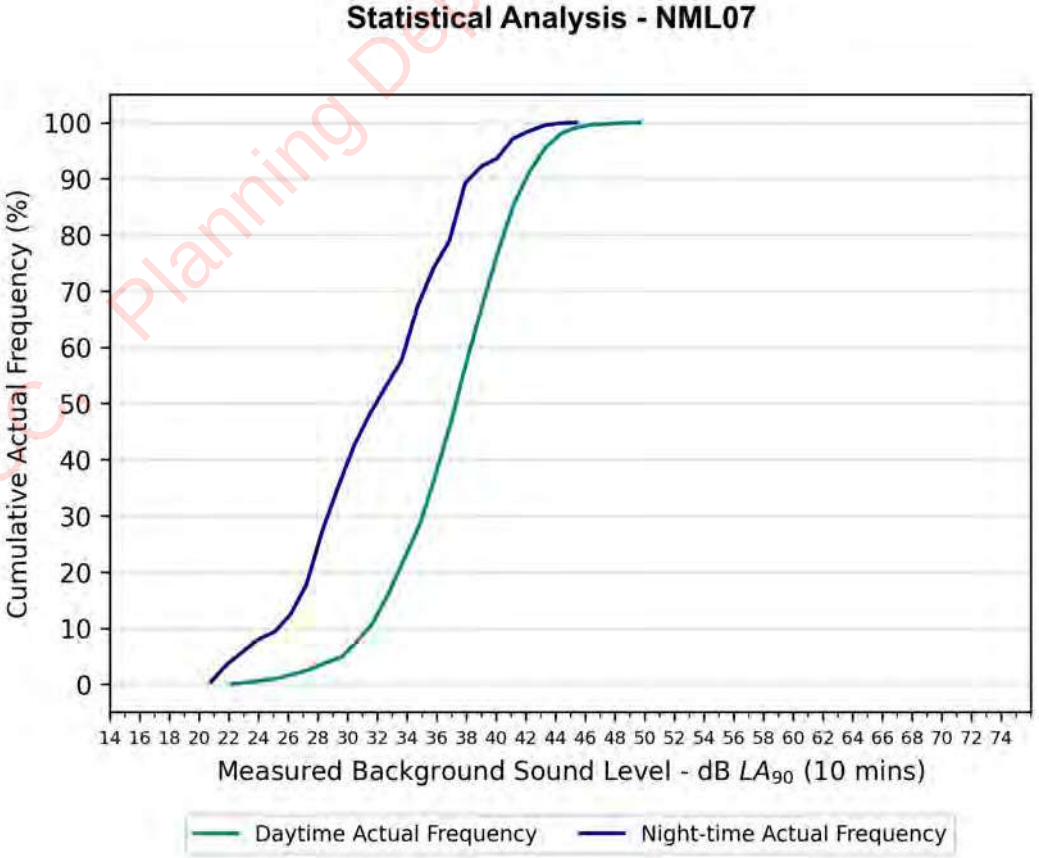




Annex 4 – Noise Modelling Data

Sound Level

Serial No.: 1ZPL0041134582

Measurement Details	
Measurement Standard	IEC 60076-10:2016
Measurement Method	Sound Intensity Method
Measurement Procedure	Walk around
Frequency Resolution	⅓ Octave Band
Acoustic Filter Function	A-weighted

Measurement Instruments	Manufacturer	Type	Serial No.
Sound Level Meter	Brüel & Kjaer	2270	3023666
Sound Level Meter Calibration	Brüel & Kjaer	4297	3082325

X The equipment used has been laboratory calibrated in accordance with manufacturers recommendations and field calibrated before and after each measurement session.

Test Program

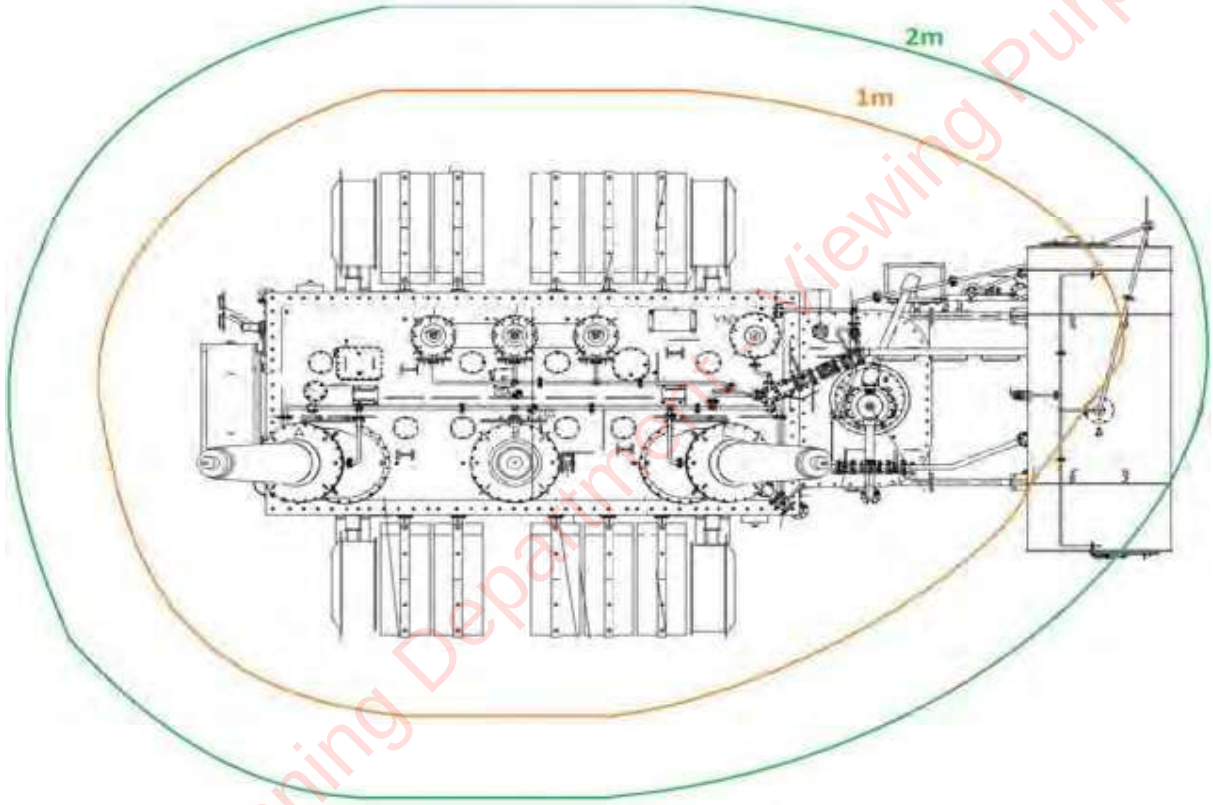
Test #	No-Load condition [%]	Load condition [%]	Tap position	Number of fans	Number of pumps	Frequency [Hz]	Distance [m]	Prescribed contour [m]	Height [m]	Surface area [m²]	Surface measure [dB]	Top oil temperature [°C]	Guarantee [dB(A)]	Sound Pressure Level [dB(A)]
1	100		11	0		50	1.0	31.1	5.2	193	22.9			54.0
2	100		11	8		50	2.0	37.5	5.2	270	24.3			63.4
3		100	11	0		50	1.0	31.1	5.2	193	22.9			56.1
4		100	11	8		50	2.0	37.5	5.2	270	24.3			63.5
5														
6														
7														
8														
1+4	100	100		8			2.0						70.0	63.8

Standard: IEC 60076-10
Test Date 16/08/2021
Test Engineer Kamil Maliński

Sound Level

Serial No. : 1ZPL001134582

Prescribed Contours				
x Distance	L_m Prescribed contour	h Height	S Surface area	L_S Surface measure
[m]	[m]	[m]	[m²]	[dB]
1	31.1	5.2	192.82	22.9
2	37.5	5.2	270	24.3



Sound Level

Serial No. : 1ZPL001134582

Measurement 1

Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation	Frequency	Distance	Prescribed contour	Height	Surface area	Surface measure	Top oil temperature	Guarantee
[%]	[kV]	[%]	[A]				[Hz]	[m]	[m]	[m]	[m²]	[dB]	[°C]	[dB(A)]
100	33			11	0		50	1	31.1	5.2	192.8	22.9		

Measurement duration: 85 s

	Frequency	L_{pAi}		L_{pAi}	$L_{pAi} - L_{pAi}$	Pressure Intensity Correction	L_{pA}	L_{WA}
	[Hz]	[dB(A)]		[dB(A)]	[dB(A)]		[dB(A)]	[dB(A)]
Total Sound Level		**54.0**	**1**	**57.3**	**3.3**	**A**	**54.0**	**76.9**
Octave Band	63	15.5	1	23.3	7.8	A	16.8	39.6
	125	36.6	1	39.9	3.2	A	36.6	59.5
	250	53.3	1	56.2	2.9	A	53.3	76.1
	500	44.5	1	47.5	3.0	A	44.5	67.3
	1000	33.4	1	40.3	6.8	A	33.4	56.3
	2000	28.8	1	40.1	11.3	A	28.8	51.6
	4000	31.3	1	40.8	9.5	A	31.3	54.1
	8000	34.6	1	43.3	8.7	A	34.6	57.4
½ Octave Band	50	13.3	1	13.5	0.3	A	13.3	36.1
	63	14.2	1	16.0	1.8	A	14.2	37.0
	80	10.9	-1	21.8	10.9	A	0.0	0.0
	100	35.6	1	37.5	1.9	A	35.6	58.4
	125	24.6	1	34.3	9.6	A	24.6	47.5
	160	28.4	1	31.6	3.2	A	28.4	51.3
	200	40.3	1	43.4	3.1	A	40.3	63.1
	250	38.0	1	41.2	3.1	A	38.0	60.9
	315	52.9	1	55.8	2.9	A	52.9	75.8
	400	38.4	1	41.1	2.7	A	38.4	61.2
	500	40.8	1	43.9	3.1	A	40.8	63.7
	630	39.6	1	42.7	3.1	A	39.6	62.5
	800	30.9	1	36.3	5.4	A	30.9	53.7
	1000	28.6	1	35.3	6.7	A	28.6	51.4
	1250	24.3	1	34.8	10.5	A	24.3	47.1
	1600	24.1	1	35.3	11.2	A	24.1	47.0
	2000	23.8	1	35.5	11.7	A	23.8	46.7
	2500	24.1	1	35.1	11.0	A	24.1	46.9
	3150	25.6	1	35.9	10.4	A	25.6	48.4
	4000	26.7	1	36.1	9.3	A	26.7	49.6
	5000	27.1	1	36.1	9.0	A	27.1	49.9
	6300	28.4	1	37.5	9.2	A	28.4	51.2
	8000	30.1	1	39.1	9.1	A	30.1	52.9
	10000	30.7	1	38.9	8.1	A	30.7	53.6

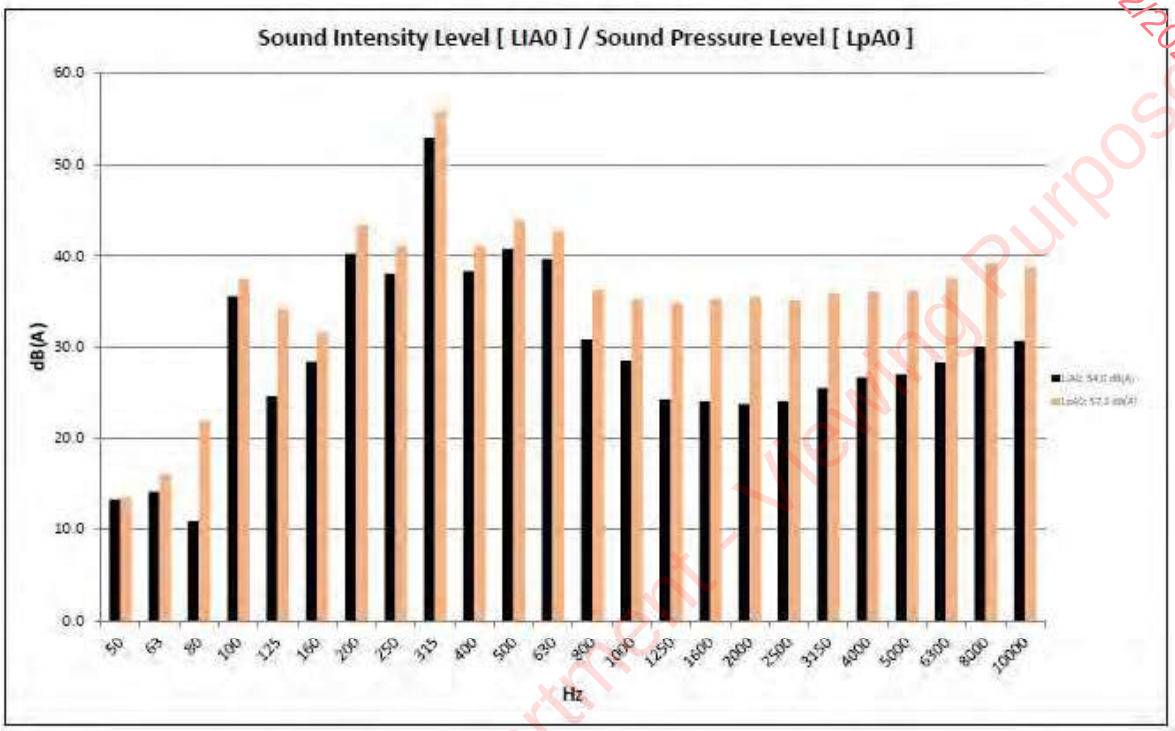
Case A: Applies, if the total P-I index is $\Delta L \leq 4$ dB. Then it follows $L_{pA} = L_{pAi}$ for both the total sound level and sound levels of the individual frequency bands.

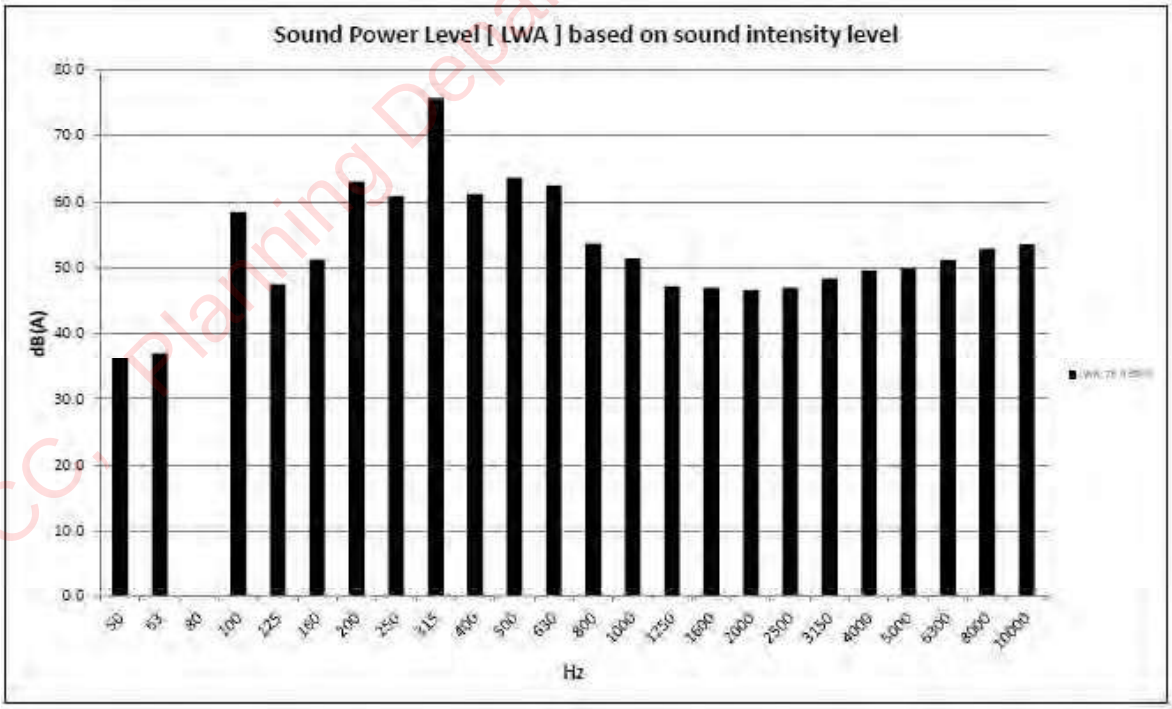
Case B: Applies, if the total P-I index is 4 dB $< \Delta L \leq 8$ dB. Then it follows $L_{pA} = L_{pAi} - 4$ dB for both the total sound level and sound levels of the individual frequency bands.

Sound Level

Serial No. : 1ZPL001134582

Measurement 1





Sound Level

Serial No. : 1ZPL001134582

Measurement 2

Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation	Frequency	Distance	Prescribed contour	Height	Surface area	Surface measure	Top oil temperature	Guarantee
[%]	[kV]	[%]	[A]				[Hz]	[m]	[m]	[m]	[m²]	[dB]	[°C]	[dB(A)]
100	33			11	8		50	2	37.5	5.2	270.0	24.3		

Measurement duration: 95 s

	Frequency	L_{wA0}		L_{pA0}	$L_{pA0} - L_{wA0}$	Pressure Intensity Correction	L_{pA}	L_{WA}
	[Hz]	[dB(A)]		[dB(A)]	[dB(A)]		[dB(A)]	[dB(A)]
Total Sound Level		63.4	1	65.6	2.2	A	63.4	87.7
Octave Band	63	33.4	1	34.1	0.7	A	33.4	57.8
	125	47.7	1	49.2	1.5	A	47.7	72.0
	250	58.5	1	60.3	1.9	A	58.5	82.8
	500	58.5	1	60.7	2.2	A	58.5	82.8
	1000	57.2	1	59.6	2.4	A	57.2	81.5
	2000	50.6	1	53.3	2.6	A	50.6	74.9
	4000	46.7	1	49.8	3.0	A	46.7	71.0
	8000	41.6	1	46.1	4.6	A	41.6	65.9
⅓ Octave Band	50	26.8	1	27.3	0.5	A	26.8	51.1
	63	24.0	1	23.6	-0.4	A	24.0	48.3
	80	31.7	1	32.6	0.9	A	31.7	56.0
	100	39.9	1	41.4	1.5	A	39.9	64.2
	125	43.6	1	45.0	1.4	A	43.6	67.9
	160	44.2	1	45.7	1.5	A	44.2	68.5
	200	49.2	1	50.9	1.7	A	49.2	73.5
	250	52.1	1	53.7	1.6	A	52.1	76.4
	315	56.6	1	58.6	2.0	A	56.6	80.9
	400	52.8	1	55.1	2.2	A	52.8	77.2
	500	52.8	1	55.1	2.3	A	52.8	77.1
	630	55.1	1	57.2	2.2	A	55.1	79.4
	800	54.1	1	56.5	2.4	A	54.1	78.4
	1000	52.1	1	54.5	2.3	A	52.1	76.5
	1250	50.0	1	52.5	2.6	A	50.0	74.3
	1600	47.7	1	50.3	2.6	A	47.7	72.0
	2000	45.3	1	48.0	2.7	A	45.3	69.6
	2500	43.6	1	46.3	2.7	A	43.6	67.9
	3150	42.7	1	45.6	2.9	A	42.7	67.0
	4000	42.3	1	45.4	3.1	A	42.3	66.6
	5000	40.6	1	43.7	3.1	A	40.6	64.9
	6300	37.9	1	41.9	4.0	A	37.9	62.2
	8000	36.3	1	41.1	4.8	A	36.3	60.6
	10000	35.9	1	41.0	5.1	A	35.9	60.3

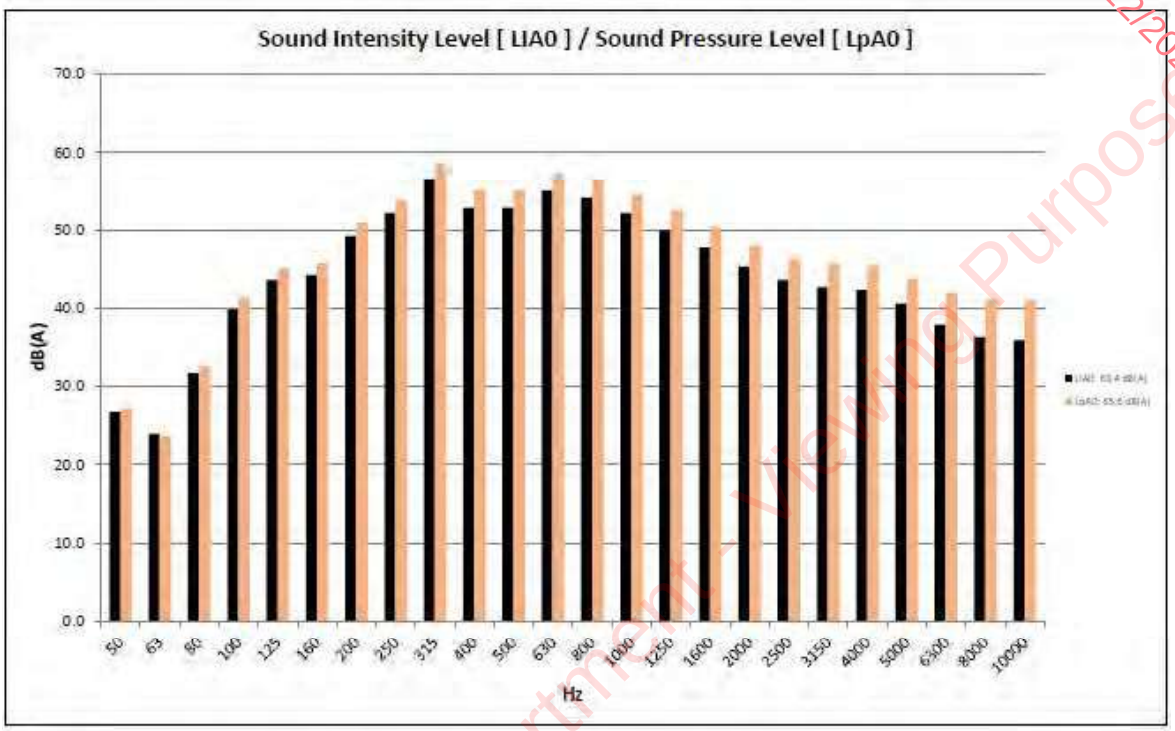
Case A: Applies, if the total P-I index is $\Delta L \leq 4$ dB. Then it follows $L_{pA} = L_{wA}$ for both the total sound level and sound levels of the individual frequency bands.

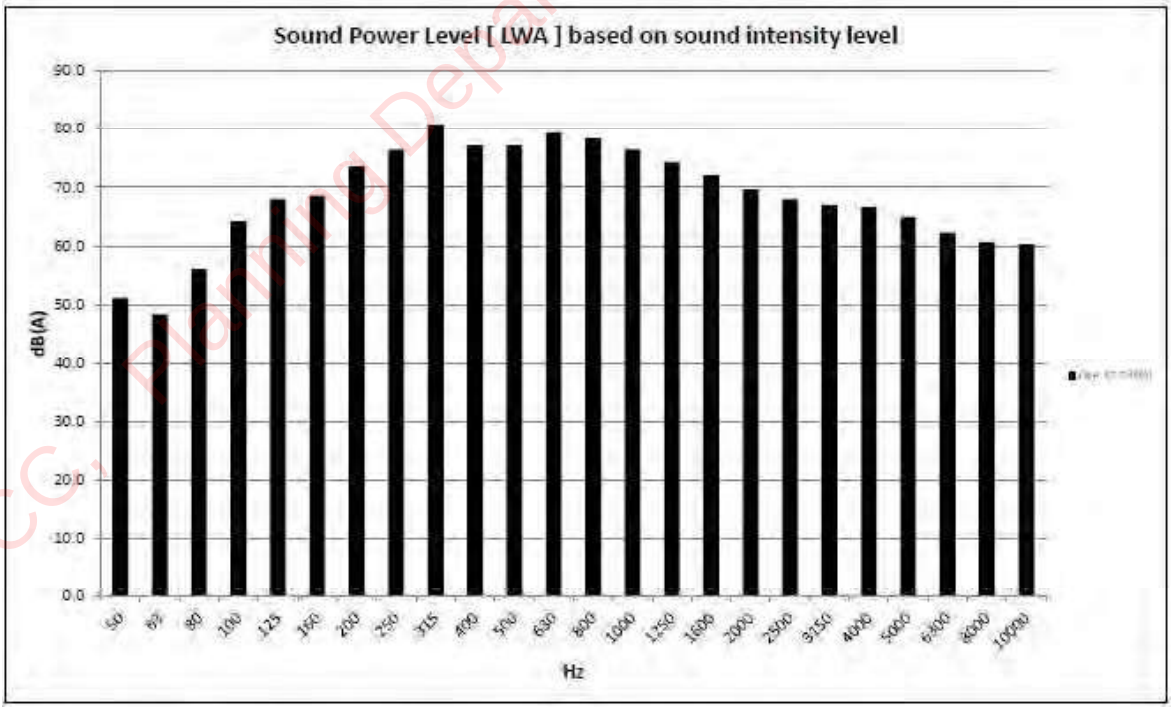
Case B: Applies, if the total P-I index is 4 dB < $\Delta L \leq 8$ dB. Then it follows $L_{pA} = L_{wA} - 4$ dB for both the total sound level and sound levels of the individual frequency bands.

Sound Level

Serial No. : 1ZPL001134582

Measurement 2





Sound Level

Serial No. : 1ZPL001134582

Measurement 3

Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation	Frequency	Distance	Prescribed contour	Height	Surface area	Surface measure	Top oil temperature	Guarantee
[%]	[kV]	[%]	[A]				[Hz]	[m]	[m]	[m]	[m²]	[dB]	[°C]	[dB(A)]
		100	262.43	11	0		50	1	31.1	5.2	192.8	22.9		

Measurement duration: 85 s

	Frequency	L_{WA}		L_{pAd}	L_{pAd} - L_{pAf}	Pressure Intensity Correction	L_{pA}	L_{WA}
	[Hz]	[dB(A)]		[dB(A)]	[dB(A)]		[dB(A)]	[dB(A)]
Total Sound Level		**56.1**	**1**	**58.1**	**2.1**	**A**	**56.1**	**78.9**
Octave Band	63	40.3	1	46.7	6.4	A	40.3	63.2
	125	55.0	1	56.5	1.5	A	55.0	77.9
	250	47.0	1	49.4	2.4	A	47.0	69.9
	500	39.9	1	43.3	3.4	A	39.9	62.7
	1000	37.9	1	42.2	4.3	A	37.9	60.7
	2000	39.0	1	43.1	4.1	A	39.0	61.9
	4000	28.6	1	38.2	9.6	A	28.6	51.4
	8000	18.4	1	31.5	13.1	A	18.6	41.4
⅓ Octave Band	50	40.2	1	46.5	6.4	A	40.2	63.0
	63	24.6	1	30.1	5.6	A	24.6	47.4
	80	21.0	1	29.3	8.3	A	21.0	43.9
	100	49.0	1	51.8	2.8	A	49.0	71.8
	125	38.9	1	41.0	2.1	A	38.9	61.7
	160	53.7	1	54.6	0.9	A	53.7	76.5
	200	42.2	1	44.7	2.5	A	42.2	65.1
	250	39.7	1	42.0	2.3	A	39.7	62.5
	315	43.9	1	46.2	2.3	A	43.9	66.7
	400	37.4	1	40.5	3.1	A	37.4	60.3
	500	33.8	1	37.6	3.8	A	33.8	56.7
	630	32.4	1	36.3	3.8	A	32.4	55.3
	800	31.9	1	35.3	3.4	A	31.9	54.8
	1000	32.2	1	37.2	5.0	A	32.2	55.0
	1250	34.7	1	38.9	4.3	A	34.7	57.5
	1600	37.3	1	40.7	3.3	A	37.3	60.2
	2000	31.3	1	37.0	5.7	A	31.3	54.1
	2500	30.8	1	36.0	5.2	A	30.8	53.6
	3150	25.5	1	34.7	9.1	A	25.5	48.4
	4000	24.1	1	33.6	9.5	A	24.1	46.9
	5000	20.2	1	31.3	11.1	A	20.2	43.0
	6300	17.3	1	28.7	11.4	A	17.3	40.2
	8000	12.5	1	26.4	13.9	A	12.5	35.3
	10000	2.9	-1	23.9	21.0	A	0.0	0.0

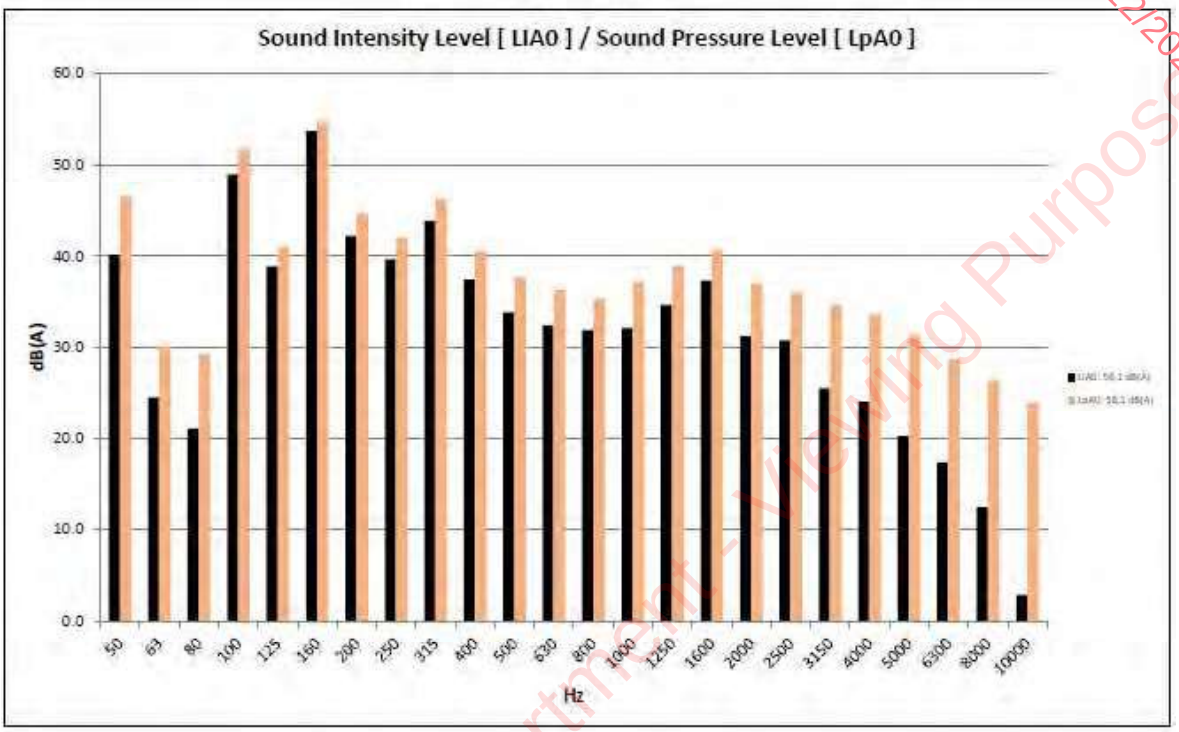
Case A: Applies, if the total P-I index is $\Delta L \leq 4$ dB. Then it follows $L_{pA} = L_{pAf}$ for both the total sound level and sound levels of the individual frequency bands.

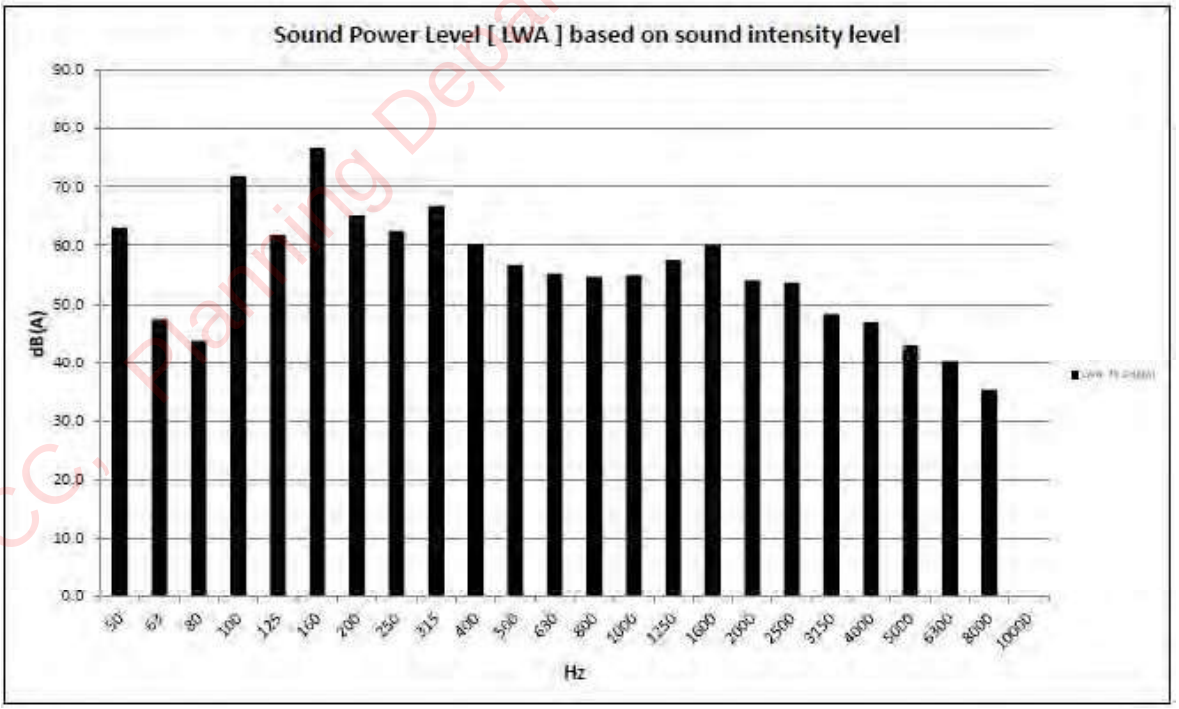
Case B: Applies, if the total P-I index is 4 dB < $\Delta L \leq 8$ dB. Then it follows $L_{pA} = L_{pAf}$ - 4 dB for both the total sound level and sound levels of the individual frequency bands.

Sound Level

Serial No. : 1ZPL001134582

Measurement 3





Sound Level

Serial No. : 1ZPL001134582

Measurement 4

Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation	Frequency	Distance	Prescribed contour	Height	Surface area	Surface measure	Top oil temperature	Guarantee
[%]	[kV]	[%]	[A]				[Hz]	[m]	[m]	[m]	[m²]	[dB]	[°C]	[dB(A)]
		100	262.43	11	8		50	2	37.5	5.2	270.0	24.3		

Measurement duration: 89 s

	Frequency	L_{WA0}		L_{pA0}	$L_{pA0} - L_{WA0}$	Pressure Intensity Correction	L_{pA}	L_{WA}
	[Hz]	[dB(A)]		[dB(A)]	[dB(A)]		[dB(A)]	[dB(A)]
Total Sound Level		**63.5**	**1**	**65.5**	**2.0**	**A**	**63.5**	**87.8**
Octave Band	63	40.1	1	43.3	3.2	A	40.1	64.4
	125	55.3	1	56.9	1.6	A	55.3	79.6
	250	56.9	1	58.6	1.7	A	56.9	81.2
	500	58.3	1	60.4	2.1	A	58.3	82.6
	1000	57.4	1	59.6	2.2	A	57.4	81.7
	2000	51.1	1	53.5	2.4	A	51.1	75.4
	4000	47.0	1	49.3	2.3	A	47.0	71.3
	8000	39.9	1	41.6	1.8	A	39.9	64.2
½ Octave Band	50	39.4	1	42.7	3.3	A	39.4	63.8
	63	23.1	1	28.0	4.9	A	23.1	47.4
	80	30.8	1	33.5	2.6	A	30.8	55.1
	100	47.6	1	50.6	2.9	A	47.6	71.9
	125	44.2	1	45.9	1.7	A	44.2	68.5
	160	54.1	1	55.3	1.2	A	54.1	78.4
	200	49.4	1	50.9	1.6	A	49.4	73.7
	250	52.1	1	53.6	1.6	A	52.1	76.4
	315	53.7	1	55.6	1.9	A	53.7	78.0
	400	52.7	1	54.8	2.1	A	52.7	77.0
	500	52.6	1	54.7	2.1	A	52.6	76.9
	630	54.9	1	56.9	2.1	A	54.9	79.2
	800	54.3	1	56.6	2.3	A	54.3	78.6
	1000	52.3	1	54.4	2.1	A	52.3	76.7
	1250	50.2	1	52.6	2.4	A	50.2	74.5
	1600	48.0	1	50.5	2.5	A	48.0	72.4
	2000	45.9	1	48.2	2.3	A	45.9	70.2
	2500	44.2	1	46.3	2.1	A	44.2	68.5
	3150	43.2	1	45.5	2.3	A	43.2	67.5
	4000	42.6	1	45.0	2.4	A	42.6	66.9
	5000	40.5	1	42.6	2.1	A	40.5	64.8
	6300	37.2	1	39.4	2.1	A	37.2	61.5
	8000	34.5	1	35.9	1.4	A	34.5	58.8
	10000	32.1	1	33.0	0.9	A	32.1	56.4

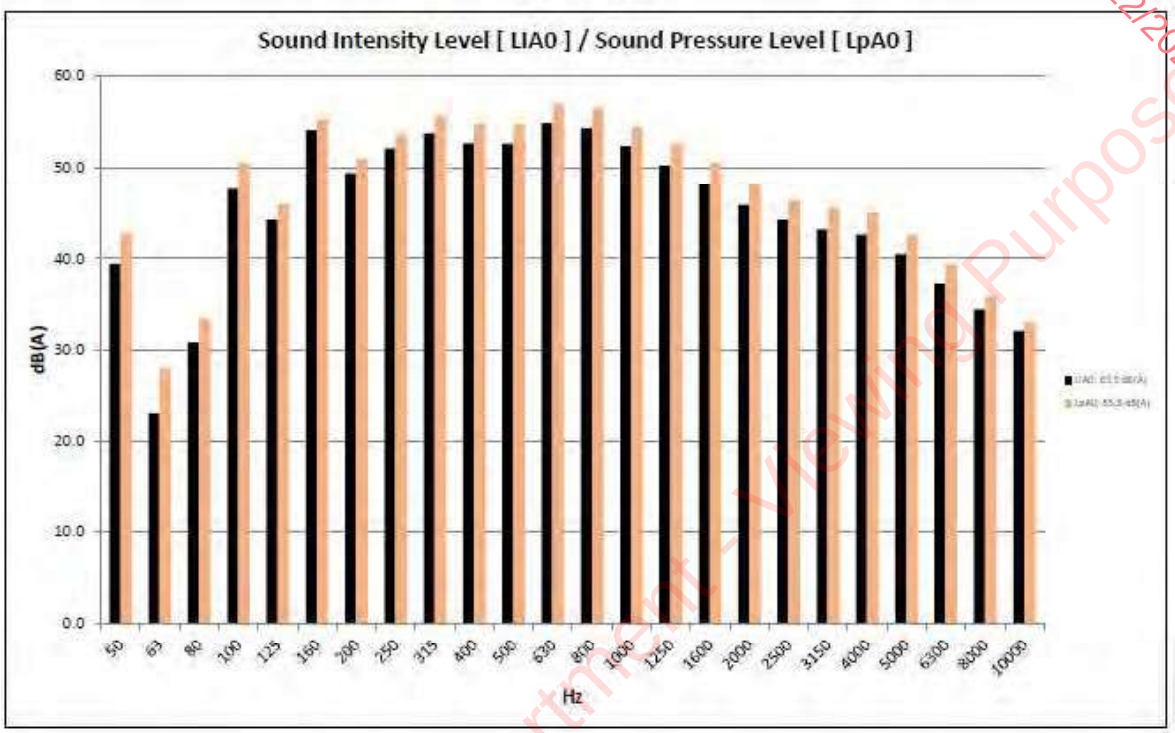
Case A: Applies, if the total P-I index is $\Delta L \leq 4$ dB. Then it follows $L_{pA} = L_{pA0}$ for both the total sound level and sound levels of the individual frequency bands.

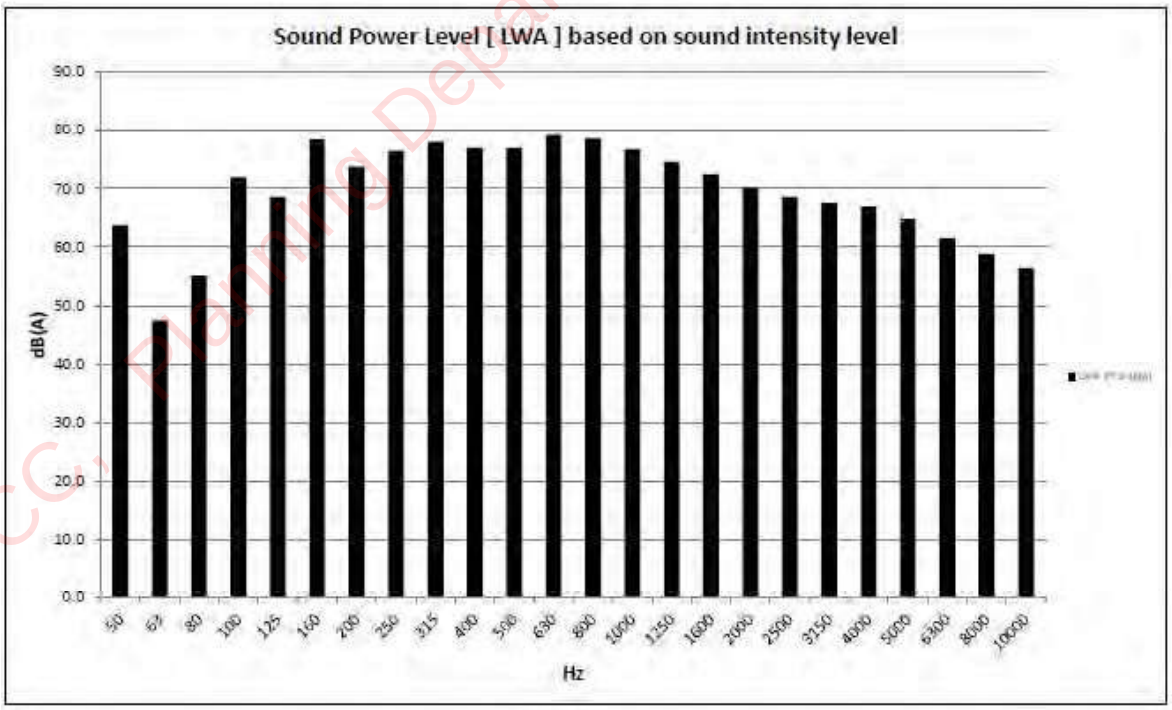
Case B: Applies, if the total P-I index is 4 dB $< \Delta L \leq 8$ dB. Then it follows $L_{pA} = L_{pA0} - 4$ dB for both the total sound level and sound levels of the individual frequency bands.

Sound Level

Serial No. : 1ZPL001134582

Measurement 4





Sound Level

Serial No. : 1ZPL001134582

Combination of sound level measurements

Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation
[%]	[kV]	[%]	[A]			
100	33	100	262.43		8	

	Frequency	Measurement 1 Sound Power Level	Measurement 4 Sound Power Level		Combined Sound Power Level
	[Hz]	[dB(A)]	[dB(A)]		[dB(A)]
Total Sound Level		76.9	87.8		**88.2**
Octave Band	63	39.6	64.4		**64.4**
	125	59.5	79.6		**79.6**
	250	76.1	81.2		**82.3**
	500	67.3	82.6		**82.7**
	1000	56.3	81.7		**81.7**
	2000	51.6	75.4		**75.4**
	4000	54.1	71.3		**71.4**
	8000	57.4	64.2		**65.0**
⅓ Octave Band	50	36.1	63.8		**63.8**
	63	37.0	47.4		**47.8**
	80	0.0	55.1		**55.1**
	100	58.4	71.9		**72.1**
	125	47.5	68.5		**68.6**
	160	51.3	78.4		**78.4**
	200	63.1	73.7		**74.1**
	250	60.9	76.4		**76.5**
	315	75.8	78.0		**80.1**
	400	61.2	77.0		**77.1**
	500	63.7	76.9		**77.1**
	630	62.5	79.2		**79.3**
	800	53.7	78.6		**78.6**
	1000	51.4	76.7		**76.7**
	1250	47.1	74.5		**74.5**
	1600	47.0	72.4		**72.4**
	2000	46.7	70.2		**70.2**
	2500	46.9	68.5		**68.5**
	3150	48.4	67.5		**67.6**
	4000	49.6	66.9		**67.0**
	5000	49.9	64.8		**64.9**
	6300	51.2	61.5		**61.9**
	8000	52.9	58.8		**59.8**
	10000	53.6	56.4		**58.2**

Rated voltage	Applied voltage	Rated current	Applied current	Tap position	Fans in operation	Pumps in operation
[%]	[kV]	[%]	[A]			

	Frequency				Combined Sound Power Level
	[Hz]				[dB(A)]
Total Sound Level					
Octave Band	63				
	125				
	250				
	500				
	1000				
	2000				
	4000				
	8000				
⅓ Octave Band	50				
	63				
	80				
	100				
	125				
	160				
	200				
	250				
	315				
	400				
	500				
	630				
	800				
	1000				
	1250				
	1600				
	2000				
	2500				
	3150				
	4000				
	5000				
	6300				
	8000				
	10000				

Annex 5 – Figures

N

NML1
NML2
NML3
NML4
NML5
NML6
NML7

LEGEND

Proposed Project Redline

Noise Monitoring Locations (NMLs)

Noise Sensitive Receptors (NSR)

- Represented by NML1
- Represented by NML2
- Represented by NML3
- Represented by NML4
- Represented by NML5
- Represented by NML6
- Represented by NML7

Noise contours modelled in accordance with ISO9613 Part 2:1996 at a height of 4 m and displayed on a 2.5 m by 2.5 m grid. All noise sources assumed to be operating concurrently.

All levels shown as dB LAeq(t)

Rev.	Date	Amendment Details	Drawn	Approved
1	20/09/2024	FOR INFORMATION	EH	AD
0	12/09/2024	FOR INFORMATION	JCM	GC

Meters
0 500 1,000

tnei

Client: EDF renewables

Drawing Status: FOR PLANNING

Project Title: KELLYSTOWN WIND FARM

Drawing Title: FIGURE A5.1 BESS NOISE ASSESSMENT STUDY AREA

Scale:	Original Size:	Spatial Reference:
1:23,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00125-018

N

BESS AND SUBSTATION

NML5 H62 H66 H230 H302 H301 H300 H299 H229 H9 H120 H8 H36 H247 H298 H297 H355 H63 H296 H10 H121 H353 H154 H124 H347 H48 H295 H294 H293 H45 H47 H12 H228 H3 H227 H46 H4 H143 H138 H292 H150 H24

Roxborough An Chlóchbhuaile

Kierans Cross

Bankerstown Rois Bhuí

Maicens Cross

Carnanbrea

Cartanstown Baile Chartan

Carricknashanagh Carraig na Sionnach

Drumsn Lough

Standi Stone

130 113 110 120 135

H125 H64 H65 H53 H354 H256 H199 H255 H257 H37 H198 H68 H246 H253 H254 H200 H252 H54 H305 H59 H197 H155 H195 H58 H35 H250 H251 H196 H231 H57 H232 H60 H248 H249 H67 H61 H303 H304 NML6 H306 H307 H233

Keeveerstown Baile Mhic Íomhair

Castletown Baile an Chaisleáin

Cullamore

Mullary Cross

Holy Well

Longstones Na Clocha Fada

Groom An Grim

Stonehouse Stóinis

Mass Rock

Gallstown Baile Ghall

Kearneystown

103 119 70 90 100

H52 H126 H51 H77 H32 H118 H157 H156 H33 H163 H78 H79 H309 H80 H308 H234 H55 H56 H158 H236 H235 H31 H169 H69 H188 H189 H186 H187 H70 H50

Kilometre 0 0.5 1

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LEGEND

Proposed Project Redline

Noise Sensitive Receptors (NSR)

- Represented by NML1
- Represented by NML2
- Represented by NML3
- Represented by NML4
- Represented by NML5
- Represented by NML6
- Represented by NML7

Rev.	Date	Amendment Details	Drawn	Approved
1	20/09/2024	SECOND ISSUE	EH	AD
0	12/09/2024	FIRST ISSUE	JCM	GC

tnei

Client: EDF renewables

Drawing Status: FOR PLANNING

Project Title: KELLYSTOWN WIND FARM

Drawing Title: FIGURE A5.2a - Noise Assessment Study Area (Detailed)

Scale:	Original Size:	Spatial Reference:
1:40,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00125-027

N

BESS AND SUBSTATION

Standing Stones
Drumshallon Lough
Drumshallon
Droim Seálann
Ch
Kellystown
Baile Uí Cheallaig
Donnellystown
Baile Uí Dhonnai
Galroostown
Galraston
Standing Stone
Motte
Piperstown
Baile an Phiobaraigh
Cairn
Ch
Sch
Fieldstown Hill
Fieldstown
Fileastún
Cairns
Bhuithe
Drogheda

130 109 100 110 120 150 170 183 187

Kilometre
0 0.5 1

LEGEND

Proposed Project Redline

Noise Sensitive Receptors (NSR)

- Represented by NML1
- Represented by NML2
- Represented by NML3
- Represented by NML4
- Represented by NML5
- Represented by NML6
- Represented by NML7

Rev.	Date	Amendment Details	Drawn	Approved
1	20/09/2024	SECOND ISSUE	EH	AD
0	12/09/2024	FIRST ISSUE	JCM	GC

Ardee
Dunleer
Drogheda

tnei

Client: EDF renewables

Drawing Status: FOR PLANNING

Project Title: KELLYSTOWN WIND FARM

Drawing Title: FIGURE A5.1b - Noise Assessment Study Area (Detailed)

Scale:	Original Size:	Spatial Reference:
1:40,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00125-028

N

BESS AND SUBSTATION

Kilometre
0 0.5 1

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LEGEND

Proposed Project Redline

Noise Sensitive Receptors (NSR)

- Represented by NML1
- Represented by NML2
- Represented by NML3
- Represented by NML4
- Represented by NML5
- Represented by NML6
- Represented by NML7

Rev.	Date	Amendment Details	Drawn	Approved
1	20/09/2024	SECOND ISSUE	EH	AD
0	12/09/2024	FIRST ISSUE	JCM	GC

tnei

Client: EDF renewables

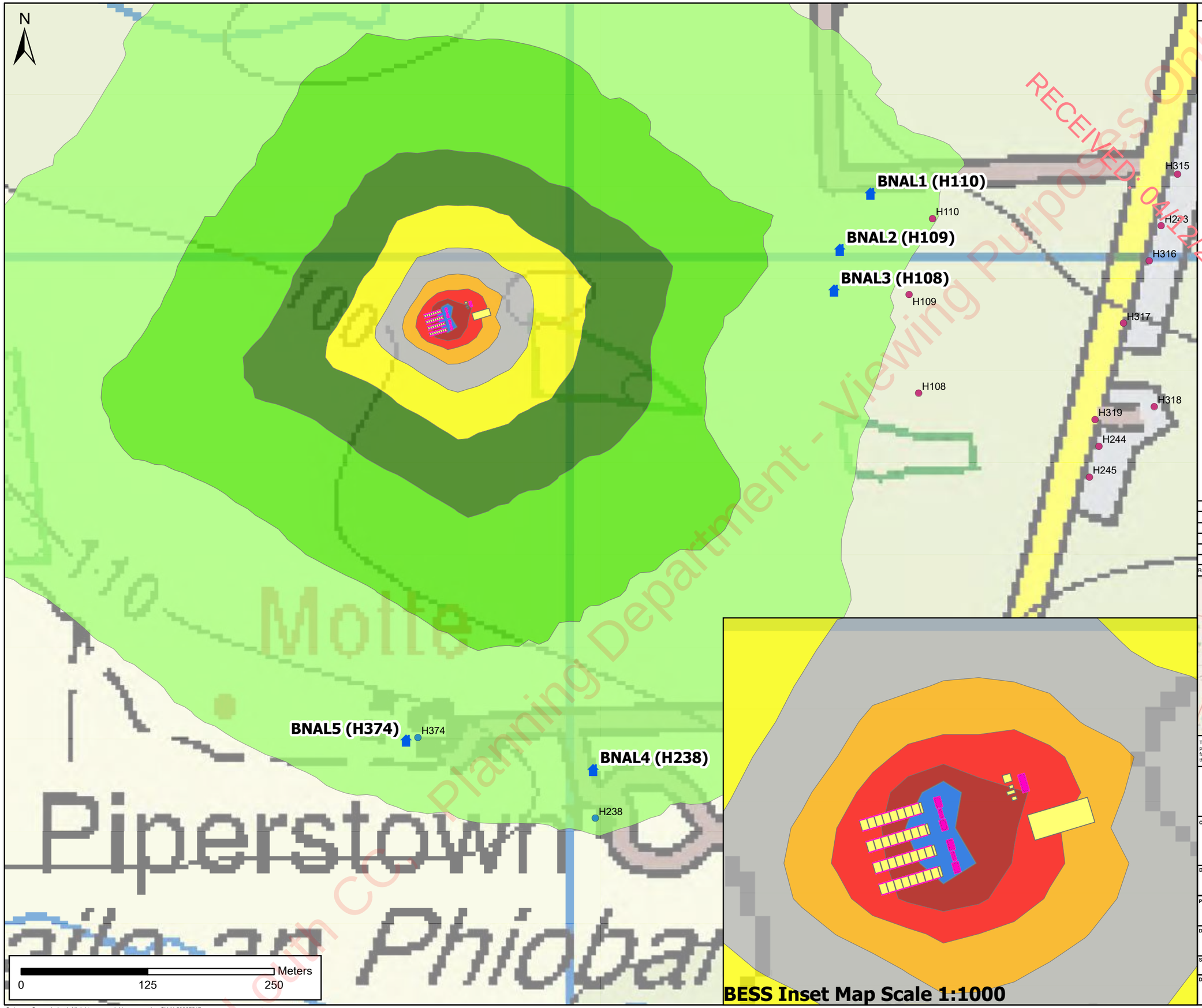
Drawing Status: FOR PLANNING

Project Title: KELLYSTOWN WIND FARM

Drawing Title: FIGURE A5.1c - Noise Assessment Study Area (Detailed)

Scale:	Original Size:	Spatial Reference:
1:40,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00125-029



LEGEND

- BESS Noise Assessment Locations (BNALs)
- BESS Modelled Noise Sources
- Buildings / Structures

Noise Sensitive Receptors (NSR)

- Represented by NML2
- Represented by NML3

Predicted Noise Levels (dBA)

30 - 35	55 - 60
35 - 40	60 - 65
40 - 45	65 - 70
45 - 50	70 - 75
50 - 55	

Noise contours modelled in accordance with ISO9613 Part 2:1996 at a height of 4 m and displayed on a 2.5 m by 2.5 m grid. All noise sources assumed to be operating concurrently.

All levels shown as dB LAeq(t)

Rev.	Date	Amendment Details	Drawn	Approved
1	20/09/2024	FOR INFORMATION	EH	AD
0	25/04/2024	FOR INFORMATION	JCM	GC

tnei

Client: EDF renewables

Drawing Status: FOR PLANNING

Project Title: KELLYSTOWN WIND FARM

Drawing Title: FIGURE A5.2 - NOISE CONTOUR PLOT FOR BNALS

Scale:	Original Size:	Spatial Reference:
1:3,500	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00125-019

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LEGEND

BESS Modelled Noise Sources

Buildings / Structures

Noise Sensitive Receptors (NSR)

- Represented by NML1
- Represented by NML2
- Represented by NML3
- Represented by NML4
- Represented by NML5
- Represented by NML6
- Represented by NML7

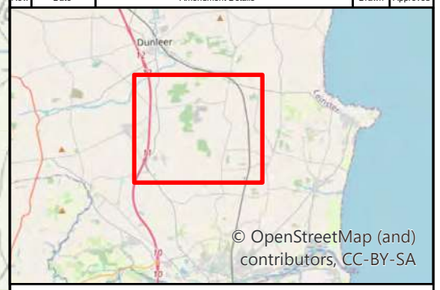
Predicted Noise Levels (dBA)

30 - 35	55 - 60
35 - 40	60 - 65
40 - 45	65 - 70
45 - 50	70 - 75
50 - 55	

Noise contours modelled in accordance with ISO9613 Part 2:1996 at a height of 4 m and displayed on a 2.5 m by 2.5 m grid. All noise sources assumed to be operating concurrently.

All levels shown as dB LAeq(t)

Rev.	Date	Amendment Details	Drawn	Approved
1	20/09/2024	FOR INFORMATION	EH	AD
0	25/04/2024	FOR INFORMATION	AD	GC



tnei

Client: EDF renewables

Drawing Status: FOR PLANNING

Project Title: KELLYSTOWN WIND FARM

Drawing Title: Figure A5.3 - Noise Contour Plot for NSRs

Scale:	Original Size:	Spatial Reference:
1:20,000	A3	IRENET95 Irish Transverse Mercator

Drawing Number: IE00125-030

0 500 1,000 Meters

Annex 6 – NSR Results

Table A6.1 - Noise Sensitive Receptors

Noise Assessment Location	Coordinates		Daytime			Night-time		
	ITM X	ITM Y	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
H1	709505	784550	11	33	-23	11	23	-13
H2	709367	784550	10	33	-23	10	23	-13
H3	707206	782871	11	34	-23	11	27	-16
H4	707318	782870	13	34	-21	13	27	-14
H5	707444	781961	12	34	-22	12	27	-15
H6	707513	781507	12	34	-23	12	27	-15
H7	707383	781906	12	34	-22	12	27	-15
H8	705584	783319	1	45	-44	1	41	-40
H9	705744	783414	2	45	-43	2	41	-39
H10	705902	783048	5	45	-40	5	41	-36
H11	708134	781146	10	34	-24	10	27	-17
H12	706829	782649	8	34	-26	8	27	-19
H13	709591	783271	21	33	-12	21	23	-2
H14	709625	783428	21	33	-12	21	23	-2
H15	709647	783479	18	33	-15	18	23	-5
H16	709657	783517	19	33	-15	19	23	-5
H17	709551	783895	15	33	-18	15	23	-8
H18	709459	783967	15	33	-18	15	23	-8
H19	709386	784693	10	33	-23	10	23	-13
H20	709354	784771	9	33	-24	9	23	-14
H21	709398	784820	9	33	-24	9	23	-14
H22	709114	784973	8	37	-29	8	31	-23
H23	709077	784968	8	37	-29	8	31	-23
H24	708564	785327	6	37	-31	6	31	-25
H25	709371	785841	5	33	-28	5	23	-18
H26	709336	785853	5	33	-28	5	23	-18
H27	709496	782453	20	35	-15	20	23	-3
H28	709526	782458	20	35	-15	20	23	-3
H29	709557	782461	19	35	-16	19	23	-4
H30	709649	782293	17	35	-18	17	23	-6
H31	707754	784932	5	37	-32	5	31	-26
H32	707338	785150	5	37	-32	5	31	-26
H33	707139	784828	6	37	-31	6	31	-25
H34	710397	782450	13	35	-22	13	23	-10
H35	705824	784510	3	43	-40	3	37	-34
H36	705550	783314	3	45	-42	3	41	-38
H37	705812	785050	0	43	-43	0	37	-37
H38	707240	781305	8	34	-26	8	27	-19
H39	707528	781402	11	34	-23	11	27	-16
H40	707291	781712	12	34	-23	12	27	-16
H41	707540	782027	13	34	-21	13	27	-14
H42	707674	782146	14	34	-21	14	27	-14
H43	708690	781931	16	34	-18	16	27	-11
H44	709175	781337	8	34	-26	8	27	-19
H45	707126	782653	12	34	-23	12	27	-16
H46	707344	782894	13	34	-21	13	27	-14
H47	706698	782663	8	34	-27	8	27	-20
H48	706639	782666	8	34	-26	8	27	-19
H49	709674	783593	17	33	-16	17	23	-6
H50	708565	784842	9	37	-28	9	31	-22
H51	707289	785222	5	37	-32	5	31	-26
H52	707364	785327	5	37	-32	5	31	-26
H53	706194	785494	0	43	-43	0	37	-37
H54	706039	784628	4	43	-39	4	37	-33
H55	707042	784741	6	37	-31	6	31	-25
H56	707077	784751	6	37	-31	6	31	-25
H57	705927	784462	3	43	-40	3	37	-34
H58	705705	784510	3	43	-40	3	37	-34
H59	705521	784573	1	43	-42	1	37	-36
H60	705656	784393	4	43	-40	4	37	-34
H61	705616	784300	4	43	-39	4	37	-33
H62	706612	783934	7	45	-38	7	41	-34
H63	705816	783140	2	45	-43	2	41	-39
H64	706071	785473	0	43	-43	0	37	-37
H65	706123	785479	0	43	-43	0	37	-37
H66	706349	783922	5	45	-40	5	41	-36
H67	705540	784312	4	43	-39	4	37	-33
H68	705596	784822	1	43	-42	1	37	-36
H69	708136	785009	8	37	-29	8	31	-23

Noise Assessment Location	Coordinates		Daytime			Night-time		
	ITM X	ITM Y	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
H70	708483	784848	9	37	-28	9	31	-22
H71	708669	784739	9	37	-28	9	31	-22
H72	709294	784805	8	33	-25	8	23	-15
H73	709311	784893	9	33	-24	9	23	-14
H74	709363	785756	4	33	-29	4	23	-19
H75	709335	785767	4	33	-29	4	23	-19
H76	709291	785868	5	33	-28	5	23	-18
H77	707293	785144	5	37	-32	5	31	-26
H78	707340	784844	6	37	-31	6	31	-25
H79	707301	784792	6	37	-31	6	31	-25
H80	707252	784779	6	37	-31	6	31	-25
H81	709390	784492	11	33	-22	11	23	-12
H82	709503	783935	15	33	-18	15	23	-8
H83	709610	783744	18	33	-15	18	23	-5
H84	709573	783753	18	33	-15	18	23	-5
H85	709535	783765	18	33	-15	18	23	-5
H86	709484	783778	18	33	-15	18	23	-5
H87	708177	781136	8	34	-26	8	27	-19
H88	707792	781047	6	34	-28	6	27	-21
H89	707456	781117	5	34	-29	5	27	-22
H90	707203	781303	7	34	-27	7	27	-20
H91	707245	781206	6	34	-29	6	27	-22
H92	707415	781706	12	34	-22	12	27	-15
H93	709577	781624	12	34	-22	12	27	-15
H94	709574	781659	12	34	-22	12	27	-15
H95	709571	781704	11	34	-23	11	27	-16
H96	709565	781730	12	34	-22	12	27	-15
H97	709652	781734	11	34	-23	11	27	-16
H98	710271	782572	14	35	-21	14	23	-9
H99	710392	782695	13	35	-22	13	23	-10
H100	710154	782410	14	35	-21	14	23	-9
H101	710096	782415	15	35	-20	15	23	-8
H102	709782	782400	17	35	-19	17	23	-7
H103	709653	782327	17	35	-18	17	23	-6
H104	709486	782375	19	35	-16	19	23	-4
H105	709265	782119	17	34	-18	17	27	-11
H106	709201	781889	14	34	-21	14	27	-14
H107	709196	781773	14	34	-20	14	27	-13
H108	709275	782875	27	38	-11	27	29	-2
H109	709266	782972	28	38	-11	28	29	-2
H110	709289	783047	27	38	-11	27	29	-2
H111	710003	783760	14	33	-19	14	23	-9
H112	709324	783893	17	33	-16	17	23	-6
H113	709411	783875	17	33	-16	17	23	-6
H114	709463	783861	16	33	-17	16	23	-7
H115	709255	783893	17	33	-16	17	23	-6
H116	709467	784495	11	33	-22	11	23	-12
H117	709282	784741	9	33	-24	9	23	-14
H118	707145	784976	4	37	-33	4	31	-27
H119	708308	786067	3	37	-34	3	31	-28
H120	705922	783376	3	45	-42	3	41	-38
H121	705963	783038	5	45	-40	5	41	-36
H122	709536	781439	9	34	-25	9	27	-18
H123	706804	782632	9	34	-25	9	27	-18
H124	706066	782611	6	45	-39	6	41	-35
H125	706111	785544	0	43	-43	0	37	-37
H126	707126	785263	5	37	-33	5	31	-27
H127	709426	784111	14	33	-19	14	23	-9
H128	709392	785462	6	33	-27	6	23	-17
H129	708305	782018	15	34	-19	15	27	-12
H130	708330	782064	16	34	-18	16	27	-11
H131	708379	782060	16	34	-18	16	27	-11
H132	708418	782035	16	34	-18	16	27	-11
H133	708356	782014	15	34	-20	15	27	-13
H134	708578	782087	19	34	-15	19	27	-8
H135	709648	781687	12	34	-22	12	27	-15
H136	709004	781720	13	34	-21	13	27	-14
H137	709126	781613	11	34	-23	11	27	-16
H138	707259	782477	13	34	-21	13	27	-14
H139	709611	781494	11	34	-23	11	27	-16

Noise Assessment Location	Coordinates		Daytime			Night-time		
	ITM X	ITM Y	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
H140	707668	782062	13	34	-21	13	27	-14
H141	707304	781411	11	34	-23	11	27	-16
H142	706657	781789	7	34	-27	7	27	-20
H143	707054	782762	10	34	-24	10	27	-17
H144	709238	784049	16	33	-17	16	23	-7
H145	709146	784894	9	37	-28	9	31	-22
H146	709081	784786	9	37	-28	9	31	-22
H147	707624	782023	13	34	-21	13	27	-14
H148	708458	786104	3	37	-34	3	31	-28
H149	709179	781738	12	34	-22	12	27	-15
H150	708515	785357	6	37	-31	6	31	-25
H151	709357	784502	11	33	-22	11	23	-12
H152	709311	785254	7	33	-26	7	23	-16
H153	708444	781087	10	34	-24	10	27	-17
H154	705947	782729	6	45	-40	6	41	-36
H155	705470	784531	1	43	-42	1	37	-36
H156	707342	784881	6	37	-31	6	31	-25
H157	707342	784908	6	37	-31	6	31	-25
H158	707196	784755	6	37	-31	6	31	-25
H159	709256	785880	5	33	-28	5	23	-18
H160	708205	782041	15	34	-19	15	27	-12
H161	708510	781960	15	34	-19	15	27	-12
H162	707719	782168	14	34	-20	14	27	-13
H163	707233.5	784825.2	6	37	-31	6	31	-25
H164	709237.4	781637.3	11	34	-23	11	27	-16
H165	709110.9	781062.7	10	34	-25	10	27	-18
H166	709367	784068.9	14	33	-19	14	23	-9
H167	709307.3	784515.3	11	33	-22	11	23	-12
H168	709351.5	785081.5	8	33	-25	8	23	-15
H169	707979.5	784968.9	6	37	-31	6	31	-25
H170	709169.2	784987.4	8	37	-29	8	31	-23
H171	709496.2	785692.6	4	33	-29	4	23	-19
H172	709459.8	785706.9	4	33	-29	4	23	-19
H173	709466.8	785745.5	5	33	-28	5	23	-18
H174	709432.8	785761	5	33	-28	5	23	-18
H175	709933.6	784019.5	13	33	-20	13	23	-10
H176	709386.8	784149.8	14	33	-20	14	23	-10
H177	709340.4	784163.5	13	33	-20	13	23	-10
H178	709318	784178.1	13	33	-20	13	23	-10
H179	709214.8	784252.1	13	33	-20	13	23	-10
H180	709312	784556.1	11	33	-22	11	23	-12
H181	709279.2	784681.9	10	33	-23	10	23	-13
H182	709116	784921.6	9	37	-29	9	31	-23
H183	709082.5	784914.3	9	37	-28	9	31	-22
H184	709070.5	784912.6	9	37	-28	9	31	-22
H185	708706.8	785254.5	7	37	-30	7	31	-24
H186	708215.9	784924.2	8	37	-29	8	31	-23
H187	707874.5	784854.3	8	37	-29	8	31	-23
H188	708178.1	784995.5	8	37	-29	8	31	-23
H189	708305.3	784968.9	7	37	-30	7	31	-24
H190	709818.4	785414.1	5	33	-28	5	23	-18
H191	709401.6	785500	6	33	-27	6	23	-17
H192	709405.2	785517.5	6	33	-27	6	23	-17
H193	709452.6	785664.7	5	33	-28	5	23	-18
H194	709455.8	785693.5	4	33	-29	4	23	-19
H195	705543.6	784509.3	3	43	-40	3	37	-34
H196	705679.6	784452.9	3	43	-40	3	37	-34
H197	705657.1	784571.7	3	43	-40	3	37	-34
H198	705651.1	784873.2	1	43	-42	1	37	-36
H199	706009.6	785392.7	1	43	-42	1	37	-36
H200	705999.1	784822.9	2	43	-41	2	37	-35
H201	708974	781721.2	13	34	-21	13	27	-14
H202	708946.8	781728.9	14	34	-20	14	27	-13
H203	708976.7	781846.6	15	34	-19	15	27	-12
H204	708935.5	781765	15	34	-20	15	27	-13
H205	708904.5	781831.1	15	34	-19	15	27	-12
H206	708838.4	781780.9	14	34	-20	14	27	-13
H207	708796.4	781872.3	15	34	-19	15	27	-12
H208	708636.2	781939.3	15	34	-19	15	27	-12
H209	708397.5	782001.6	14	34	-20	14	27	-13

Noise Assessment Location	Coordinates		Daytime			Night-time		
	ITM X	ITM Y	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
H210	708267.2	782012.9	14	34	-20	14	27	-13
H211	708078.1	782066.4	16	34	-18	16	27	-11
H212	707212.4	781200.3	5	34	-29	5	27	-22
H213	707323.5	781216.7	7	34	-27	7	27	-20
H214	707484.3	781250.6	8	34	-26	8	27	-19
H215	708081.5	781150.6	8	34	-26	8	27	-19
H216	708031.2	781227.6	8	34	-26	8	27	-19
H217	707920.3	781237.1	10	34	-24	10	27	-17
H218	707831.3	781155.3	8	34	-26	8	27	-19
H219	707748.2	781065.4	6	34	-28	6	27	-21
H220	707681.1	781206.1	8	34	-26	8	27	-19
H221	707512.9	781338.4	11	34	-23	11	27	-16
H222	707560.6	781589.9	11	34	-23	11	27	-16
H223	707469.5	781664.4	12	34	-22	12	27	-15
H224	707425.1	781885.2	12	34	-22	12	27	-15
H225	707542.1	781968.6	13	34	-22	13	27	-15
H226	707608.8	782296.7	14	34	-20	14	27	-13
H227	707268.2	782878.6	11	34	-23	11	27	-16
H228	706805.5	782611	9	34	-25	9	27	-18
H229	705896.1	783447.8	5	45	-40	5	41	-36
H230	705840.7	783862.8	5	45	-40	5	41	-36
H231	705887.4	784474.9	3	43	-40	3	37	-34
H232	706013.6	784437.4	3	43	-40	3	37	-34
H233	706701	784452.8	6	43	-37	6	37	-31
H234	707337.9	784806.7	6	37	-31	6	31	-25
H235	707505.6	784842.9	4	37	-34	4	31	-28
H236	707514	784845.3	5	37	-32	5	31	-26
H237	708102	782128	16	34	-18	16	27	-11
H238	708955.9	782454.4	26	35	-10	26	23	3
H239	709290.2	782312	20	35	-15	20	23	-3
H240	709135.9	781734.8	12	34	-22	12	27	-15
H241	709182	781682.3	13	34	-21	13	27	-14
H242	709642.3	783732.7	18	33	-15	18	23	-5
H243	709515.1	783040	24	38	-15	24	29	-6
H244	709453.7	782822.2	24	38	-15	24	29	-6
H245	709444.2	782791.5	24	38	-15	24	29	-6
H246	705566.6	784808.7	1	43	-42	1	37	-36
H247	705638.5	783305.2	2	45	-43	2	41	-39
H248	705640.1	784350	2	43	-41	2	37	-35
H249	705650.1	784374.2	4	43	-39	4	37	-33
H250	705583.4	784499.5	3	43	-40	3	37	-34
H251	705612.7	784489	2	43	-41	2	37	-35
H252	705712	784726.9	0	43	-43	0	37	-37
H253	705653.8	784814.6	1	43	-42	1	37	-36
H254	705799.6	784781.1	1	43	-42	1	37	-36
H255	705868.3	785261.9	0	43	-43	0	37	-37
H256	705937.1	785412.2	0	43	-43	0	37	-37
H257	705962.4	785280	0	43	-43	0	37	-37
H258	709052.7	781852.4	15	34	-19	15	27	-12
H259	709045.9	781725.1	13	34	-21	13	27	-14
H260	708842.9	782018	18	34	-16	18	27	-9
H261	708760.3	781877.3	15	34	-19	15	27	-12
H262	708726	781911.7	16	34	-18	16	27	-11
H263	708535	781882.7	13	34	-21	13	27	-14
H264	708421.2	781926.7	13	34	-21	13	27	-14
H265	708251.8	782077.3	16	34	-18	16	27	-11
H266	708232.7	782021.1	15	34	-19	15	27	-12
H267	708187.4	782044.2	15	34	-19	15	27	-12
H268	708163.4	782093.1	16	34	-19	16	27	-12
H269	707973.7	782091.6	14	34	-20	14	27	-13
H270	707933.1	782103.4	14	34	-20	14	27	-13
H271	707282.8	781361.1	10	34	-24	10	27	-17
H272	707283.8	781205.1	6	34	-28	6	27	-21
H273	707360	781320.4	8	34	-26	8	27	-19
H274	707423.5	781321.4	9	34	-26	9	27	-19
H275	707786.3	781092.4	7	34	-27	7	27	-20
H276	707639.8	781305	10	34	-24	10	27	-17
H277	707609.1	781309.3	10	34	-24	10	27	-17
H278	707529.8	781438.9	11	34	-23	11	27	-16
H279	707518.1	781467	11	34	-23	11	27	-16

Noise Assessment Location	Coordinates		Daytime			Night-time		
	ITM X	ITM Y	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
H280	707416.7	781419.8	11	34	-23	11	27	-16
H281	707444.9	781545.4	12	34	-22	12	27	-15
H282	707502.6	781556.6	12	34	-22	12	27	-15
H283	707478.7	781570.5	12	34	-22	12	27	-15
H284	707471.3	781630.2	12	34	-22	12	27	-15
H285	707465.6	781809.7	12	34	-22	12	27	-15
H286	707439.6	781835.4	12	34	-22	12	27	-15
H287	707401.2	781914.8	12	34	-22	12	27	-15
H288	707430.1	781935	12	34	-22	12	27	-15
H289	707569.6	781955.6	13	34	-21	13	27	-14
H290	707587.5	782057.5	13	34	-21	13	27	-14
H291	707733.4	782120.8	14	34	-20	14	27	-13
H292	707319.6	782445	13	34	-21	13	27	-14
H293	706988.6	782646.8	11	34	-23	11	27	-16
H294	706849.5	782679.3	10	34	-24	10	27	-17
H295	706756.3	782675.6	9	34	-25	9	27	-18
H296	705705.8	783100.8	5	45	-41	5	41	-37
H297	705767	783216.2	5	45	-40	5	41	-36
H298	705798.4	783285.4	2	45	-43	2	41	-39
H299	705822.1	783530.6	4	45	-41	4	41	-37
H300	705842.4	783600.1	5	45	-40	5	41	-36
H301	705902.2	783693.8	5	45	-40	5	41	-36
H302	705896.3	783829.9	3	45	-42	3	41	-38
H303	705844.1	784341.9	4	43	-39	4	37	-33
H304	705959.3	784420.1	3	43	-40	3	37	-34
H305	706102.2	784637.4	4	43	-39	4	37	-33
H306	706406.7	784566.3	5	43	-38	5	37	-32
H307	706660.8	784460.6	6	43	-37	6	37	-31
H308	707151.4	784761.1	6	37	-31	6	31	-25
H309	707353.2	784817.8	6	37	-31	6	31	-25
H310	709200.3	781828.3	14	34	-20	14	27	-13
H311	709179.1	781595.2	12	34	-22	12	27	-15
H312	709658.9	783758.1	18	33	-16	18	23	-6
H313	709632.9	783663.2	18	33	-15	18	23	-5
H314	709653.1	783553.6	17	33	-16	17	23	-6
H315	709531.2	783091.2	23	38	-15	23	29	-6
H316	709503.3	783005.3	24	38	-14	24	29	-5
H317	709477.8	782943.7	23	38	-15	23	29	-6
H318	709508.3	782861.2	23	38	-15	23	29	-6
H319	709449.7	782848.5	24	38	-14	24	29	-5
H320	708598	781026.6	10	34	-24	10	27	-17
H321	709087.7	781129.5	10	34	-24	10	27	-17
H322	709156.8	781277.7	10	34	-24	10	27	-17
H323	708832.6	781031.3	10	34	-24	10	27	-17
H324	708900.4	781061.9	10	34	-24	10	27	-17
H325	709704	783834.3	17	33	-16	17	23	-6
H326	709694	782393.4	18	35	-17	18	23	-5
H327	709722.8	782431.8	17	35	-18	17	23	-6
H328	709806.9	782438.5	17	35	-19	17	23	-7
H329	709836.6	782476.7	16	35	-19	16	23	-7
H330	709986.7	782433	15	35	-20	15	23	-8
H331	710055.1	782421.6	15	35	-20	15	23	-8
H332	710299.2	782705.5	14	35	-21	14	23	-9
H333	709156.6	781421.9	11	34	-23	11	27	-16
H334	709699.6	783772.4	17	33	-16	17	23	-6
H335	709699.6	783799.6	17	33	-16	17	23	-6
H336	709734.1	783831.2	17	33	-16	17	23	-6
H337	709777.1	783822.6	15	33	-18	15	23	-8
H338	709888.4	783758.1	16	33	-17	16	23	-7
H339	709626.1	782417.4	19	35	-16	19	23	-4
H340	709654.8	782420.3	19	35	-16	19	23	-4
H341	710092.6	782469.3	15	35	-20	15	23	-8
H342	709164.3	781300.8	9	34	-25	9	27	-18
H343	709596.5	781764.4	13	34	-21	13	27	-14
H344	709643.4	781469.4	10	34	-24	10	27	-17
H345	708678.9	781010.7	10	34	-24	10	27	-17
H346	708398.9	781161.7	10	34	-24	10	27	-17
H347	706194.3	782621	7	45	-39	7	41	-35
H348	707491.4	781202.5	8	34	-26	8	27	-19
H349	709000.1	781085.1	10	34	-24	10	27	-17

Noise Assessment Location	Coordinates		Daytime			Night-time		
	ITM X	ITM Y	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB	Rating Level, dBA	Representative Background Sound Level, dBA	Margin, dB
H350	709665.1	783563.4	17	33	-16	17	23	-6
H351	708460.7	781150.5	10	34	-24	10	27	-17
H352	708289.8	782083.3	16	34	-18	16	27	-11
H353	705857.9	782712.1	4	45	-41	4	41	-37
H354	706252.2	785485.8	0	43	-43	0	37	-37
H355	705732.8	783152.2	5	45	-40	5	41	-36
H356	709492	783869.7	16	33	-18	16	23	-8
H357	710128.4	782411.8	15	35	-20	15	23	-8
H358	709403.8	783964.6	15	33	-18	15	23	-8
H359	709923	781771.7	12	34	-22	12	27	-15
H360	709659.2	781632.3	12	34	-22	12	27	-15
H361	709031	781787.5	15	34	-20	15	27	-13
H362	707629.4	781951.9	13	34	-21	13	27	-14
H363	709129.5	781697.1	12	34	-22	12	27	-15
H364	710258.2	783746.7	13	33	-20	13	23	-10
H365	710059.3	782479.5	15	35	-20	15	23	-8
H366	707239.6	781420	11	34	-24	11	27	-17
H367	709300.8	785031.9	8	33	-25	8	23	-15
H368	708915.1	781135.5	10	34	-24	10	27	-17
H369	709538.9	783850.3	16	33	-17	16	23	-7
H370	708322.8	781177.5	10	34	-24	10	27	-17
H371	708948.6	781068.8	10	34	-24	10	27	-17
H372	708941.8	781142.5	10	34	-24	10	27	-17
H373	708972.2	781153.3	10	34	-24	10	27	-17
H374	708780.6	782534.2	27	35	-8	27	23	4

*The predictions presented here are calculated for the building centrepoint and therefore will differ from those presented within the main body of the report