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NOISE ASSESSMENT

PROPOSED BATTERY ENERGY STORAGE SYSTEM (BESS) WITH ASSOCIATED INFRASTRUCTURE, INCLUDING A SUBSTATION, EARTHWORKS, ACCESS, DRAINAGE, LANDSCAPING AND AN UNDERGROUND CABLE ROUTE CONNECTION ON LAND NORTH AND SOUTH OF NATIONAL ROAD, CILFYNYDD

REWE 2 LTD

FEBRUARY 2025

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Revision	Prepared By	Date
1.1	L Jephson BEng (Hons) MIOA	13/2/25
1.0	L Jephson BEng (Hons) MIOA	6/2/25

Contents

1. Introduction

LF Acoustics Ltd have been appointed by REWE 2 Ltd to undertake an operational noise assessment for a Proposed Battery Energy Storage System (BESS) with Associated Infrastructure, Earthworks, Access, Drainage and Landscaping and an underground cable connection, to be located on Land North and South of National Road, Cilfynydd.

It is proposed to construct the BESS on land to the north of National Road, with a substation constructed on the land to the south. The BESS would be connected to Cilfynydd 400kV Substation via a buried cable.

The following section of this report presents an overview of the relevant standards and guidelines applicable when assessing noise from this type of facility. Section 3 provides a description of the site, its surroundings and proposed operation, with an assessment of the existing noise environment provided in Section 4. The calculation and assessment of noise levels associated with the operation of the site is provided in Section 5. Consideration of the potential cumulative impacts associated with the operation of the BESS, proposed consented wind farm to the south, and consented synchronous condenser to the east of the substation is provided in Section 6. Finally, Section 7 provides a summary of the assessment.

2. Standards and Guidelines

A description of the noise units referred to in this report is provided in Appendix A.

2.1. Planning Policy Wales

Planning Policy Wales (PPW) revised in February 2024 [1], sets out the Government's planning policies for Wales and how these should be applied. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales.

With regards renewable and low carbon developments, PPW advises:

Planning authorities should also identify and require suitable ways to avoid, mitigate or compensate adverse impacts of renewable and low carbon energy development. The construction, operation, decommissioning, remediation and aftercare of proposals should take into account:

- *the need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations.*

A number of Technical Advice Notes (TAN) accompany PPW. TAN 11 [2] relates to noise. For noise generating development, TAN 11 advises:

Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.

For industrial and commercial developments, TAN 11 advises that BS 4142 should be adopted to assess potential impacts. The 1990 revision of the Standard is indicated within the document, has been withdrawn and consideration has therefore been given to the current revision of the Standard within this assessment.

2.2. British Standard BS 4142:2014+A1:2019

BS 4142 [3] is the British Standard for rating and assessing noise of a commercial or industrial nature and is relevant to the noise associated with the operation of the proposed plant.

BS 4142 is a comparative standard in which the estimated noise levels from the proposed development are compared to the representative / typical background noise level from existing uses.

BS 4142 relates the likelihood of adverse impact to the difference between the Rating Level of the noise being assessed and the background noise level.

The background noise level is the L_{A90} noise level, usually measured in the absence of noise from the source being assessed but may include other existing industrial or commercial sounds. The background noise levels should generally be obtained from a series of measurements each of not less than 15-minute duration.

The Rating Level of the noise being assessed is defined as its L_{Aeq} noise level (the 'specific noise level'), with the addition of appropriate corrections should the noise exhibit a marked impulsive and/or tonal component or should the noise be irregular enough in character to attract attention. The extent of the correction is dependent upon the degree of tonality or character in the noise

and is determined either by professional judgement, where the plant is not operational at present, or by measurement.

Where the noise is tonal in nature, the standard imposes the following penalties when assessing the rating level:

- 2 dB for a tone which is just perceptible;
- 4 dB where the tone is clearly perceptible; and
- 6 dB where the tone is highly perceptible.

Methods for identifying whether noise is tonal in nature are provided within BS 4142.

Where noise exhibits other sound characteristics, the Standard advises a penalty of 3 dB should be applied.

During the daytime, the specified noise levels are determined over a reference time interval of 1 hour, with a 15-minute reference period adopted when assessing night-time noise.

If the Rating Level of the noise being assessed exceeds the background level by 10 dB or more BS 4142 advises that there is likely to be an indication of a significant adverse impact, depending upon context. A difference between background level and Rating Level of around 5 dB is likely to be an indication of an adverse impact, depending upon context. The lower the Rating Level is, relative to the background noise level, the less likely the specific source will have an adverse or significant adverse impact. Where the Rating Level does not exceed the background noise level is an indication of a low impact, depending upon context.

The assessment method outlined above is intended for the assessment of external noise levels and is not intended to assess the extent of impact at internal locations.

Where the initial assessment of impact, based upon and assessment of the external noise levels, needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level of sound;
- Where background sound levels and rating levels are low, 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; and
- The sensitivity of the receptor and whether the premises will already incorporate measures to ensure good internal and/or external acoustic conditions.

The current revision of BS 4142 does not define low background or rating levels. The previous revisions of the Standard described very low background sounds as being less than 30 dB L_{A90} and low rating levels as being less than 35 dB $L_{Aeq,T}$. The Association of Noise Consultants have prepared a technical note to accompany the current revision of BS 4142 [4]. The document advises that it would not be unreasonable to adopt similar lower limits when assessing noise levels against the current revision of the Standard

2.3. British Standard BS 8233

British Standard BS 8233 [5] principally provides design guidance for new buildings. For residential premises, the guidance advises for steady external noise sources, levels of noise internally not exceeding 30 dB $L_{Aeq,\ 8\ hour}$ within bedrooms at night are desirable, with a level of 35 dB $L_{Aeq,\ 16\ hour}$ representing a desirable standard of noise within living rooms and bedrooms for resting purposes during daytime periods.

Externally within gardens and amenity spaces, the guidance recommends a general limit of 50 dB $L_{Aeq,\ T}$.

2.4. World Health Organisation Guidelines

The World Health Organisation guidance [6] provides additional guidance upon potential effects in relation to noise.

The guidance advises:

- few people are moderately annoyed by noise levels of below 50 dB L_{Aeq} during the daytime;
- for a good night's sleep, noise levels within bedrooms should not exceed 30 dB L_{Aeq}, with individual noise events not exceeding 45 dB L_{Amax}; and
- special attention should be given to noise sources in an environment with low background noise levels and to noise sources with low frequency components.

Assuming an open window provides a reduction in noise levels of between 10 – 15 dB(A), during the night-time the WHO guidance indicates that external noise levels should remain below 40 – 45 dB L_{Aeq} to maintain the restorative processes of sleep.

The WHO produced additional noise guidance in relation specifically to night-time noise in 2009 [5], which is generally considered to be the most noise sensitive period. This report provides a description of the no observed adverse effect level (which is equivalent to a No Observed Effects Level, NOEL) and advises for night-time noise (which is considered to be the most sensitive period of the day) that this concept is less useful, as the adversity of effects are less clear. Instead, it advises the use of the observed effects thresholds, above which an effect starts to occur or shows itself to be dependent upon the exposure level.

The guidance is presented in terms of external and internal recommendations to minimise any potential adverse effects. Externally, the guidance advises that an average night-time noise level L_{night} (the $L_{Aeq,\ 8\ hour}$) of 40 dB is equivalent to the Lowest Observed Adverse Effect Level (LOAEL) and advises this guideline value is recommended for the protection of public health from night-noise. However, below this level there was no change in the small number of awakenings identified and hence a reason for considering that the NOEL was not an appropriate descriptor in noise terms for identifying adverse effects and hence recommend the use of the observed effects threshold as an appropriate descriptor to identify the potential for the onset of adverse effects.

The guidance, however, advises that an external night-time noise level of 30 $L_{Aeq,\ 8\ hour}$ would be equivalent to the NOEL, as their research indicated that there were no detectable effects on sleep observed below this level.

The potential for Significant Observed Adverse Effects (SOAEL) were identified to occur at levels considerably above 40 dB $L_{Aeq,\ 8\ hour}$.

3. Site Description and Identification of Potentially Affected Dwellings

The location of the proposed BESS is indicated on Figure 1, with the proposed site layout, upon which this assessment has been based, indicated on Figure 2.

As indicated on Figure 2, the site would be split across two main areas either side of National Road. The main site area would be located to the north of the road, where the BESS plant and equipment would be located, with a separate substation located on land to the south of the road.

The batteries within the BESS would charge and discharge periodically during the day and overnight. They would generally discharge during periods of peak demand, typically around breakfast time and early evening. Charging would normally occur during periods when demand upon the network is low, or during periods of excess generation, and thus could be either during the day or overnight.

The main sources of noise within the BESS would be attributable to the operation of the cooling fans on the battery containers and Power Conversion Systems (PCS). The fans on the equipment are temperature controlled and would normally only operate when the plant was either generating or discharging, with their speed dependent upon the ambient temperatures.

A substation would be constructed within the southern area of the site, to enable the generated electricity to be supplied to the main Cilfynydd substation. The main source of noise within the substation would be associated with the operation of a 33 / 400KV transformer. Whilst the transformer would typically generate low levels of noise, particularly overnight, it would be fan-cooled, with the fans potentially operating during periods of high temperatures.

There are a small number of noise sensitive properties neighbouring the proposed BESS, which have the potential to be affected by noise attributable to the operation of the plant and equipment within the site. Those identified and considered within this assessment are indicated on Figure 1.

4. Baseline Noise Assessment

4.1. Unattended Noise Surveys

Unattended noise surveys have been undertaken at three positions representative of the neighbouring noise sensitive properties to establish the prevailing background noise levels over the periods the solar farm would be operational.

The survey was carried out between 20 – 27 September 2023.

Rion NL-52 Class 1 Sound Level Meters were used for the exercise, which were calibrated before and after the exercise using a Rion NC-75 Class 1 Acoustic Calibrator, with the instruments reading 94.0 dB on each occasion. All the instrumentation used had been laboratory calibrated within the past 12/24 months in accordance with national standards. Details of the instrumentation used and most recent calibration dates are provided below (the copies of the calibration certificates can be provided upon request).

Position	Instrument	Serial No.	Calibration Date	Laboratory / Certificate No.
1 Trefychan Farm	Rion NL-52 Class 1 SLM	00231657	21/4/23	AcSoft – 1505168-1
2 Tai'r-waun-isaf	Rion NL-52 Class 1 SLM	01021287	15/3/23	AcSoft – 1504856-2
3 Northern Site Boundary	Rion NL-52 Class 1 SLM	00231656	7/3/23	AcSoft – 1504771-1
All	Rion NC-75 Class 1 Acoustic Calibrator	35270122	5/9/23	AcSoft – 1506421-1

Table 4.1 Instrumentation Details

Measurements were made at the positions indicated on Figure 1.

At each position, the microphone was set freefield and at a height of 1.3 metres from the ground. The microphones were fitted with Rion WS-15 outdoor microphone protection, to ensure Class 1 performance was maintained under a wide range of weather conditions.

The instruments were configured to monitor over 15-minute periods throughout the duration of the survey, in accordance with the requirements of BS 4142.

Each instrument had an audio recording option card installed, which enabled periodic audio snapshots of the noise environment to be captured, along with any particular activities giving rise to high noise levels, thus enabling particular sources to be identified.

The survey period was selected to ensure weather conditions remained favourable for undertaking environmental surveys. Conditions during the survey period remained generally dry, with calm conditions or light winds.

A summary of the weather conditions during the survey is provided below.

Date		Conditions	Wind Strength	Wind Direction
Wednesday	20/9/23	Mainly dry. Light rain during evening	2 m/s	SW
Thursday	21/9/23	Periods of rain am, dry pm	0 – 2 m/s	SW
Friday	22/9/23	Fine & Dry	0 – 1 m/s	SW
Saturday	23/9/23	Fine & Dry	Calm	-
Sunday	24/9/23	Fine & Dry	0 – 1 m/s	W
Monday	25/9/23	Fine & Dry	Calm	-
Tuesday	26/9/23	Fine & Dry	Calm	-
Wednesday	27/9/23	Fine & Dry	Calm	-

Table 4.2 Summary of Weather Conditions

The results of the noise monitoring exercise carried out at each location are summarised and discussed in the following sub-sections.

4.2. Results of Noise Monitoring Carried Out at Position 1 – Trefychan Farm

The noise monitoring equipment at this location was positioned located to the north of the farm. This position was considered representative of the noise environment at the farmhouse and at Trefychan Cottage and Craig-Leyshon Villas to the north.

Noise levels monitored at this location were noted to be influenced by road traffic from vehicles travelling along the A470 to the west.

The results of the noise monitoring at this location are provided within Appendix B.

To establish the typical background noise levels, a statistical analysis of the measured noise levels has been undertaken for the day, evening and the night-time periods.

The statistical analysis is presented in Appendix B, with the typical levels determined from the analysis provided below:

- Daytime (07:00 – 19:00 hours) – 44 dB $L_{A90,15\ min}$;
- Evening (19:00 – 23:00 hours) – 41 dB $L_{A90,15\ min}$;
- Night-time (23:00 – 07:00 hours) – 40 dB $L_{A90,15\ min}$.

4.3. Results of Noise Monitoring Carried Out at Position 2 – Tai'r-waun-isaf

The noise monitoring equipment at this location was positioned within the field to the north-west of the property.

Noise levels monitored at this location were noted to be influenced by distant road traffic.

The results of the noise monitoring at this location are provided within Appendix C.

Typical background noise levels have been established at this location based upon a statistical analysis of the measured noise levels. The analysis is presented in Appendix C, with the typical levels determined from the analysis provided below:

- Daytime (07:00 – 19:00 hours) – 40 dB $L_{A90,15\ min}$;
- Evening (19:00 – 23:00 hours) – 35 dB $L_{A90,15\ min}$;
- Night-time (23:00 – 07:00 hours) – 37 dB $L_{A90,15\ min}$;

4.4. Results of Noise Monitoring Carried Out at Position 3 – Northern Site Boundary

The noise monitoring equipment at this location was positioned along the northern site boundary. The noise measurements obtained at this position were considered to be representative of Garth-fawr and Garth Hall to the north.

The windshield on the instrument was noted to be removed at around 07:00 on Sunday. Consequently, the survey at this location was terminated at that time.

The results of the noise monitoring at this location are provided within Appendix D.

Typical background noise levels have been established at this location based upon a statistical analysis of the measured noise levels. The analysis is presented in Appendix D, with the typical levels determined from the analysis provided below:

- Daytime (07:00 – 19:00 hours) – 43 dB $L_{A90,15\ min}$;
- Evening (19:00 – 23:00 hours) – 36 dB $L_{A90,15\ min}$;
- Night-time (23:00 – 07:00 hours) - 36 dB $L_{A90,15\ min}$;

5. Calculation and Assessment of Noise from the Operation of the Site

5.1. Proposed Plant and Equipment

There would be a number of battery containers within the site, which would be grouped in pairs. For each group of batteries, there would be a Power Conversion System (PCS) skid. A substation compound would be positioned within the southern area of the site.

The battery containers would be liquid-cooled, with a number of small fans located within the container. The PCS would also have fan cooling.

The fans within the battery containers and PCS would be temperature controlled, with their speeds varying depending upon the operating loads and ambient temperatures. Typically, the fans would only operate at higher speed during periods of very high temperatures (>30^{o}C) and would normally operate at lower speeds, thus generating lower levels of noise, particularly during the evening periods and overnight, when ambient temperatures are lower.

To minimise noise levels, the battery containers and PCS would be fitted with noise control systems to reduce the operational noise.

Source term noise levels for the proposed plant have been obtained from manufacturers' specifications and are provided in Table 5.1 below.

Plant	Sound Pressure Level [dB(A)]	Sound Power Level SWL [dB(A)]	Octave Band Sound Power Level SWL [dB]							
			63	125	250	500	1k	2k	4k	8k
e-storage Solbank 3.0 Battery Containers (Cooling Plant)	< 72 @1m	81	65	70	73	75	76	75	70	66
Sunny Central Storage UP-S (PCS) With Low Noise Kit	<61 @10m	87	75	82	89	81	79	82	89	85
BESS Transformer	-	65	54	69	68	66	52	44	38	38
Substation Transformer	73 @ 1m	97	87	101	101	99	84	76	70	70

Table 5.1 Source Term Noise Levels

Four-metre-high absorptive acoustic barriers would also be constructed around the battery stations, to screen the fan extracts and plant containers. Screening to a height of 4 metres is also proposed along the western side of the substation to provide effective screening from the neighbouring farm. The location of the mitigation is indicated as a green line on the modelled noise level results.

5.2. Calculation of Noise Levels

As indicated above, the main noise generating elements of the proposed development would be attributable to the operation of the battery stations, PCS and substation.

Calculations of the noise levels attributable to the operation of the site have been made using the SoundPlan computer modelling package, which implements the calculation methodology from ISO 9613-2.

The calculations have taken account of the land formation around the site based upon Lidar mapping, with the ground absorption across the surrounding fields assumed to be soft.

Calculations have been prepared on the basis of all plant fully operational, which represents the likely worst-case conditions during the peak operational periods.

The operation of the cooling fans within the plant and equipment is temperature controlled. Generally, when the plant is not under load, the fans would be less likely to operate and would only be likely to operate at full speed during periods of high ambient temperatures and whilst the plant was discharging or charging. Assuming the fans fully operational therefore represents unlikely worst-case conditions, particularly for the overnight periods.

Noise levels have been calculated on the basis of the site layout indicated on Figure 2.

Figure 3 presents the calculated operational noise levels in graphical format and additionally provide the calculated façade noise levels in numerical form at the properties potentially most likely to be affected by the operation of the site. The calculated noise levels at the potentially most affected properties are additionally summarised in Table 5.2 below.

Location	**Calculated Façade Noise Level at First Floor Level [dB $L_{Aeq.T}$]**
Trefychan Farm	30
Trefychan Cottage	31
Craig-Leyshon Villas	30
Tai'r-wain-isaf	29
Garth-fawr	32
Garth Hall	28

Table 5.2 Noise Levels Generated by Operation of Proposed BESS

5.3. Assessment Criteria

A preliminary assessment has been made in accordance with the BS 4142 methodology, to demonstrate that the operation would not result in adverse noise impacts at surrounding properties and thus comply with the requirements of the NPPF.

BS 4142 additionally advises that the context should be considered when identifying impact and ensuring that the operation of the proposed development does not result in adverse noise impacts within the properties.

Consideration, therefore, has also been given to criteria contained within BS 8233 and within the WHO night-time noise guidance, which provides guidance on absolute noise levels to ensure potential adverse impacts are minimised.

BS 8233 advises for steady state external noise sources, such as those associated with the operation of the site, it is desirable that the internal ambient noise level does not exceed a level of 35 dB $L_{Aeq,16\ hour}$ during the daytime period within living rooms and bedrooms and 30 dB $L_{Aeq,\ 8\ hour}$ within bedrooms at night. On the basis of an open window typically providing a sound reduction of between 10 – 15 dB(A), equivalent external levels below 45 dB $L_{Aeq,\ 16\ hour}$ daytime and 40 dB $L_{Aeq,\ 8\ hour}$ night-time, would ensure an acceptable noise environment was maintained within the surrounding properties and seek to minimise any potential adverse noise impacts.

Additionally, for steady state noise as associated with the operation of the proposed equipment, the WHO night-noise guidance advises that an external level of 40 dB $L_{Aeq,\ 8\ hour}$ represents the Lowest Observed Adverse Effect Level (LOAEL) overnight (thus representative of the night-time operation).

5.4. Assessment

The assessment of the operational noise levels at the potentially most affected properties is provided below.

Based upon the calculated noise levels, the operation of the plant and equipment would not be tonal at the surrounding properties, although the noise is likely to exhibit other sound characteristics compared to the current noise environment, which is principally attributable to distant road traffic noise. On this basis, it has been considered appropriate to apply a 3 dB other characteristic noise correction within BS 4142 to derive the rating level of noise.

Uncertainties in the calculations have been considered. Given that the assessment has been based upon all plant and equipment fully operational, which is considered unlikely, particularly during the most sensitive night-time periods, the calculations are likely to have overestimated the noise levels at the dwellings and thus cover any uncertainty in the noise levels attributable to the operation of the plant or within the calculation methodology. It is additionally noted that the source data used represents the maximum design level for the plant.

Trefychan Farm

Noise levels attributable to the operation of the site at this property would be influenced by noise from the substation and the main BESS site. As indicated previously, mitigation is proposed to ensure the plant and equipment is effectively screened from the property.

The initial operational noise assessment at this location is provided below.

	Assessment Period		
	Daytime	**Evening**	**Night-time**
Specific Noise Level	31	31	31
Acoustic Feature Correction	3	3	3
Rating Level	34	34	34
Background Noise Level [dB L_{A90}]	44	41	36
Excess of Rating Over Background Level	-10	-7	-2
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.3 BS 4142 Assessment – Trefychan Farm

The initial BS 4142 assessment above indicates that the noise levels attributable to the operation of the BESS would be very low at this property. With the mitigation measures as proposed, the operational noise levels are not anticipated to exceed the prevailing background noise levels thus resulting in a low potential for adverse impact.

Trefychan Cottage

The initial BS 4142 assessment for this location is provided in the table below.

	Assessment Period		
	Daytime	**Evening**	**Night-time**
Specific Noise Level	31	31	31
Acoustic Feature Correction	3	3	3
Rating Level	34	34	34
Background Noise Level [dB L_{A90}]	44	41	36
Excess of Rating Over Background Level	-10	-7	-2
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.4 BS 4142 Assessment – Trefychan Cottage

Noise levels associated with the operation of the BESS at this property would be very low, with the initial assessment indicating operational noise levels remaining at least 2 dB(A) below the prevailing background noise levels.

The noise levels attributable to the operation would remain commensurate with a No Observed Effects Level, when assessed against the WHO night-noise guidelines.

The operation would therefore not result in any adverse impacts.

Craig-Leyshon Villas

The initial BS 4142 assessment for this location is provided in the table below.

	Assessment Period		
	Daytime	**Evening**	**Night-time**
Specific Noise Level	30	30	30
Acoustic Feature Correction	3	3	3
Rating Level	33	33	33
Background Noise Level [dB L_{A90}]	44	41	36
Excess of Rating Over Background Level	-11	-8	-3
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.5 BS 4142 Assessment – Craig-Leyshon Villas

Noise levels attributable to the night-time operation of the BESS at these properties would remain low. The initial BS 4142 assessment above indicates a low potential for an adverse impact overnight, with noise levels remaining below the prevailing background noise levels. The noise levels attributable to the operation would remain commensurate with a No Observed Effects Level, when assessed against the WHO night-noise guidelines.

On this basis, the operation of the site would not result in any adverse noise impacts at this location.

Tai'r-wain-isaf

The initial BS 4142 assessment for this location is provided in the table below.

	Assessment Period		
	Daytime	**Evening**	**Night-time**
Specific Noise Level	29	29	29
Acoustic Feature Correction	3	3	3
Rating Level	32	32	32
Background Noise Level [dB L_{A90}]	40	35	37
Excess of Rating Over Background Level	-8	-3	-5
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.6 BS 4142 Assessment – Tai'r-wain-isaf

Noise levels attributable to the operation of the BESS at this location would remain low. The initial BS 4142 assessment above indicates a low potential for an adverse impact, with noise levels remaining below the prevailing background noise levels throughout the day and night-time

periods. The noise levels attributable to the operation would remain commensurate with a No Observed Effects Level, when assessed against the WHO night-noise guidelines.

Noise levels at this location, with the incorporated mitigation measures proposed for the BESS, would therefore remain acceptable and ensure any potential adverse noise impacts were minimised.

Garth-fawr

The initial BS 4142 assessment for this property, based upon the highest noise levels calculated, is provided in the table below.

	Assessment Period		
	Daytime	**Evening**	**Night-time**
Specific Noise Level	32	32	32
Acoustic Feature Correction	3	3	3
Rating Level	35	35	35
Background Noise Level [dB L_{A90}]	43	40	36
Excess of Rating Over Background Level	-8	-5	-1
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.7 BS 4142 Assessment – Garth-fawr

Noise levels associated with the operation of the BESS at this property would be very low, with the initial assessment indicating operational noise levels remaining at least 2 dB(A) below the prevailing background noise levels. Noise levels would additionally remain commensurate with a No Observed Effects Level when considered against the WHO night-noise guidelines.

The operation would therefore not result in any adverse impacts at this location.

Garth Hall

The initial BS 4142 assessment for this property, based upon the highest noise levels calculated, is provided in the table below.

	Assessment Period		
	Daytime	**Evening**	**Night-time**
Specific Noise Level	28	28	28
Acoustic Feature Correction	3	3	3
Rating Level	31	31	31
Background Noise Level [dB L_{A90}]	43	40	36
Excess of Rating Over Background Level	-8	-9	-5
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.8 BS 4142 Assessment – Garth Hall

Noise levels attributable to the operation of the BESS at this location would be very low, with the assessment above indicating the operational noise levels remaining at least 5 dB(A) below the prevailing background noise levels. Noise levels would additionally remain commensurate with a No Observed Effects Level when considered against the WHO night-noise guidelines

The operation of the BESS would therefore not result in a potential for adverse noise impacts at this location.

6. Cumulative Noise Assessment

Consideration has been given to the potential cumulative noise assessment associated with the operation of the Proposed Development, the proposed Twyn Hywel Wind Farm (Application Ref. DNS/3272053), which will be constructed to the south and a proposed synchronous condenser (Application Ref. 23/0470/FUL), which is to be constructed on land to the east of the Cilfynydd substation.

The noise assessments prepared for the wind farm and synchronous condenser for the planning applications have been reviewed to evaluate the noise levels at properties that could potentially be affected by the operation of the three developments.

Noise levels were predicted at Tai'r-waun-isaf for the wind farm. The predictions, made at a height of 10 metres indicated noise levels at this property from the operation of the wind farm of between 24.9 dB(A) at wind speeds of 4m/s rising to 31.5 dB(A) at wind speeds of 12 m/s. No noise impacts were identified at this property, with the noise levels remaining substantially below the noise impact thresholds for the wind farm.

With regards to the synchronous condenser, no calculations or specific assessments were made at properties close to the Proposed BESS Development. However, the noise maps indicate noise levels at the closest properties to the two sites, with operational noise levels attributable to the operation of the synchronous condenser of between 20 – 25 dB $L_{Aeq,T}$ at Tai'r-waun-isaf and Garth Hall. The synchronous condenser would potentially operate on a 24-hour basis.

Considering the cumulative assessment at Garth Hall attributable to the operation of the BESS and the synchronous condenser, the overall noise levels from both sites would be up to 31 dB $L_{Aeq,T}$. The overall noise levels at this property would therefore remain below the prevailing background noise levels throughout the day and night-time periods and at a level commensurate with the No Observed Effects Level, when considered against the WHO night-noise guidance. No cumulative impacts have therefore been identified at this location.

Noise levels at Tai'r-waun-isaf would potentially be influenced by noise from the operation of the three developments. The cumulative noise levels associated with the operation of the Proposed BESS development, synchronous condenser, and wind farm would be 32 dB $L_{Aeq,T}$ at wind speeds of 4m/s rising to 34 dB $L_{Aeq,T}$ at wind speeds of 12 m/s. The overall noise levels at this property would therefore remain below the prevailing background noise levels throughout the day and night-time periods and at a level commensurate with the No Observed Effects Level, when considered against the WHO night-noise guidance. No cumulative impacts have therefore been identified at this location.

On the basis of the above assessments, no cumulative impacts have been identified at neighbouring properties to the Proposed Development.

7. Summary

LF Acoustics Ltd have been appointed by REWE 2 Ltd to undertake an operational noise assessment for a Proposed Battery Energy Storage System (BESS) with Associated Infrastructure, Earthworks, Access, Drainage and Landscaping and underground cable route, to be located on Land North and South of National Road, Cilfynydd.

It is proposed to construct the BESS on land to the north of National Road, with a substation constructed on the land to the south. The BESS would be connected to the neighbouring Cilfynydd 400kV Substation via buried cable.

Baseline noise monitoring has been carried out at several locations around the site, at positions representative of the neighbouring noise sensitive properties, to establish the prevailing background noise levels for the day and night-time periods upon which the assessment has been based.

This report has presented calculations and an assessment of the worst-case noise levels to be generated by the operation of the BESS at the neighbouring properties, based upon the plant operating at full capacity, which is an unlikely scenario.

To ensure a satisfactory noise environment at the surrounding residential properties attributable to the operation of the BESS, mitigation would be provided for the equipment to be installed on the site, which would include noise attenuation kits for the plant and noise barriers for the BESS site, and mitigation along the western boundary of the proposed substation.

The calculated noise levels have been assessed against relevant standards and guidance, to ensure that the operation of the plant does not result in occupants of nearby properties being unacceptably affected by levels of noise.

The assessment concluded that, with the proposed mitigation measures, which include noise barriers around the BESS plant and equipment and along the western boundaries of the substation, the operation of the BESS would generate low noise levels at surrounding properties both during the day and night-time periods.

A preliminary assessment of the noise levels against the requirements of BS 4142 concluded that the operation would result in a low potential for adverse impact, with noise levels remaining below the prevailing background noise levels. Furthermore, an assessment of the overall noise levels during the night-time and early morning periods indicated the operation of the plant would result in noise levels achieving a No Observed Effects Level, thus ensuring that the operation did not result in the potential for adverse noise impacts.

Consideration has been given to the potential cumulative impacts associated with the operation of the BESS, the proposed Twyn Hywel wind farm to the south, and the synchronous condenser to east of the Cilfynydd substation. The assessment concluded that the cumulative operation of the three developments would not have a potential to result in adverse noise impacts at the neighbouring properties.

ON this basis, noise from the operation of the BESS would not result in a potential for adverse noise impacts and would result in acceptable noise levels at neighbouring properties, thus fully compliant with the requirements of TAN 11 and relevant Policies within PPW.

References

1. Welsh Government. Planning Policy Wales. Edition 12. February 2024.

2. Welsh Government. Planning Guidance (Wales). Technical Advice Note (Wales) 11, Noise – October 1997.

3. British Standards Institute. Methods for Rating and Assessing Industrial and Commercial Sound. BS 4142:2014 +A1:2019.

4. British Standards Institute. Guidance on Sound Insulation and Noise Reduction in Buildings. BS 8233: 2014.

5. World Health Organisation. Guidelines for Community Noise. 1999. WHO Geneva.

6. World Health Organisation. Night Noise Guidelines for Europe. 2009.

Figures

Figure 1:
Site Location Showing Noise Monitoring Positions

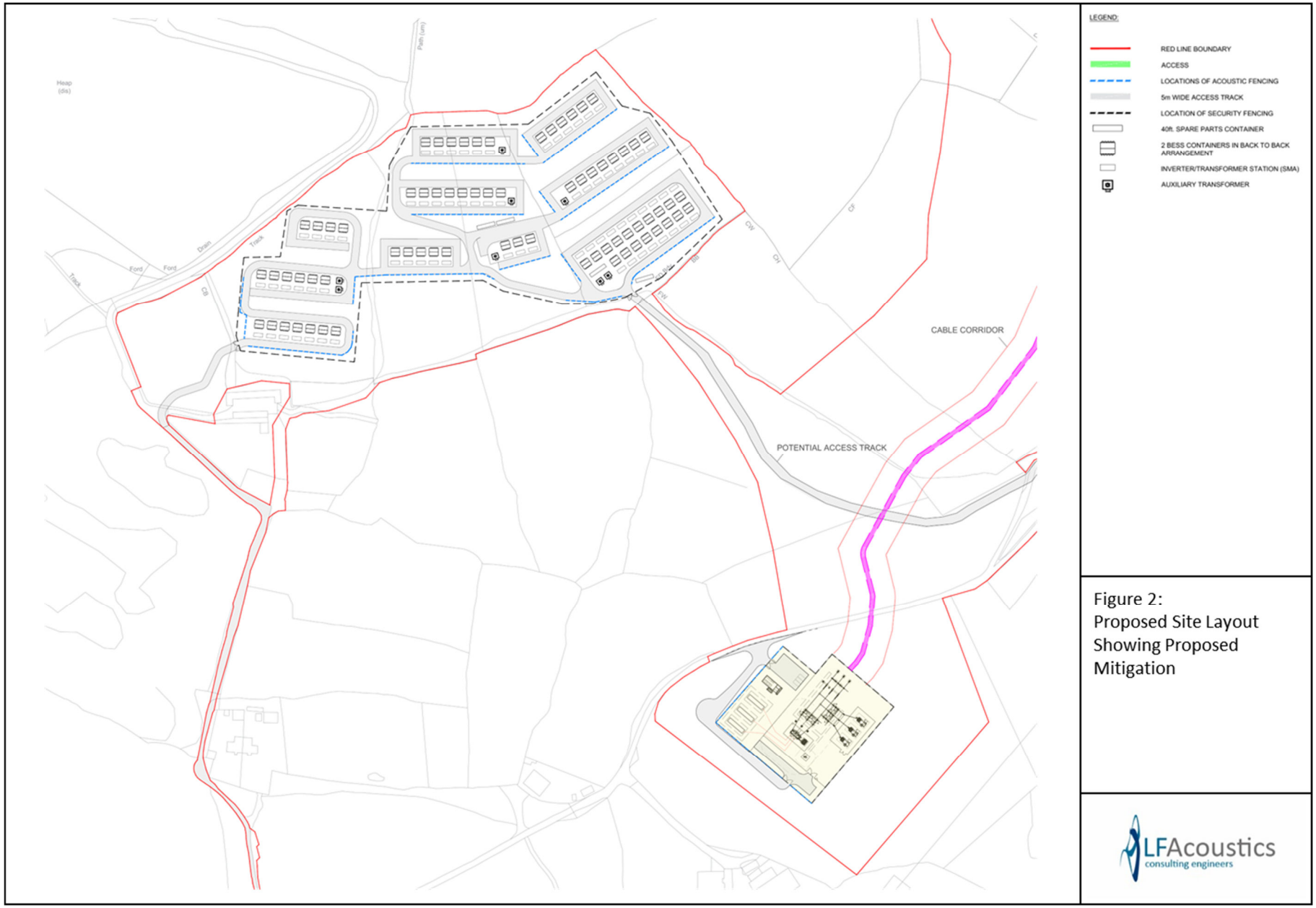

Figure 2:
Proposed Site Layout Showing Proposed Mitigation

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consulting engineers

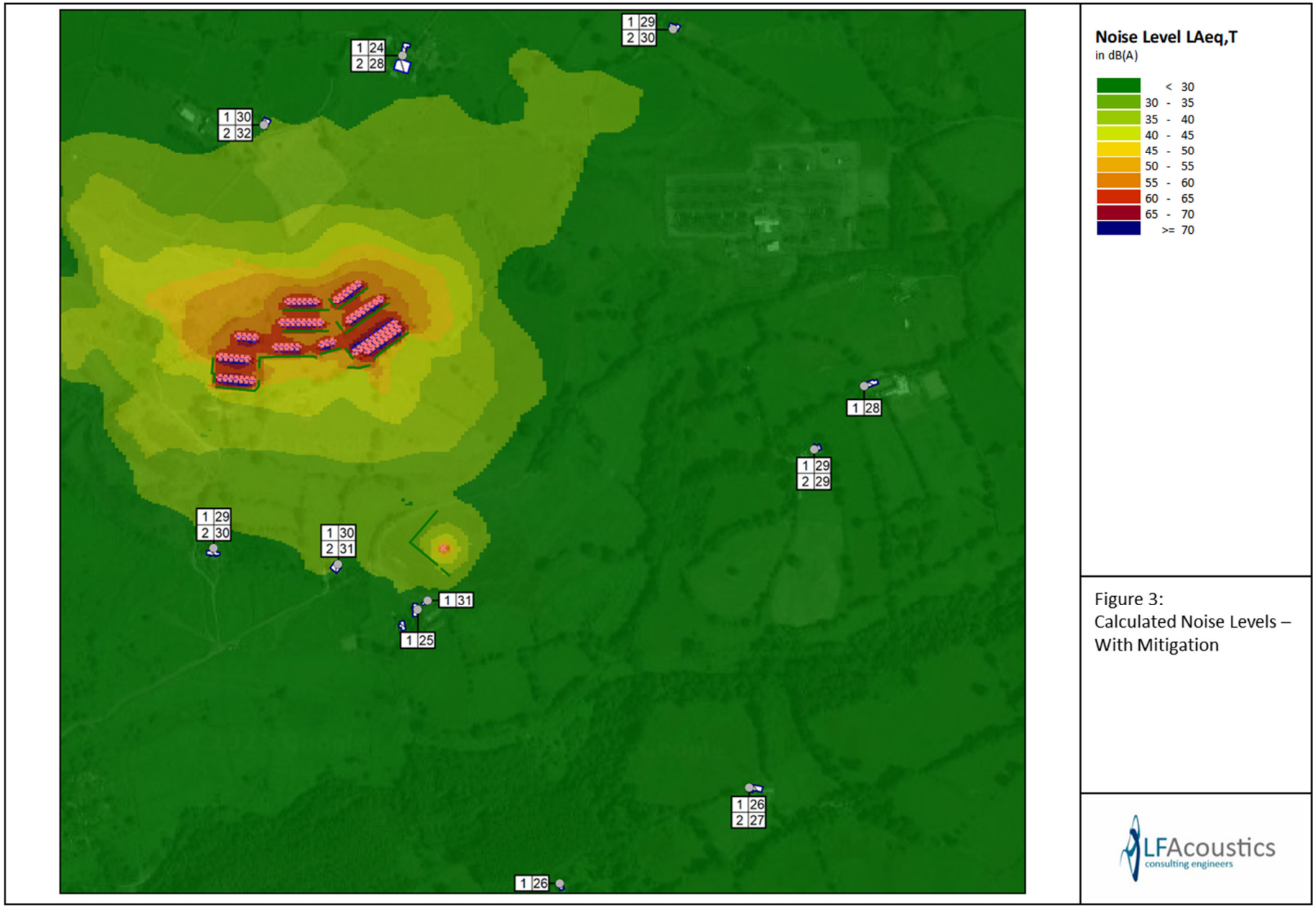

Figure 3:
Calculated Noise Levels – With Mitigation

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consulting engineers

Appendix A
Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness. A 5 dB change is generally considered to be clearly discernible.

A-weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system.

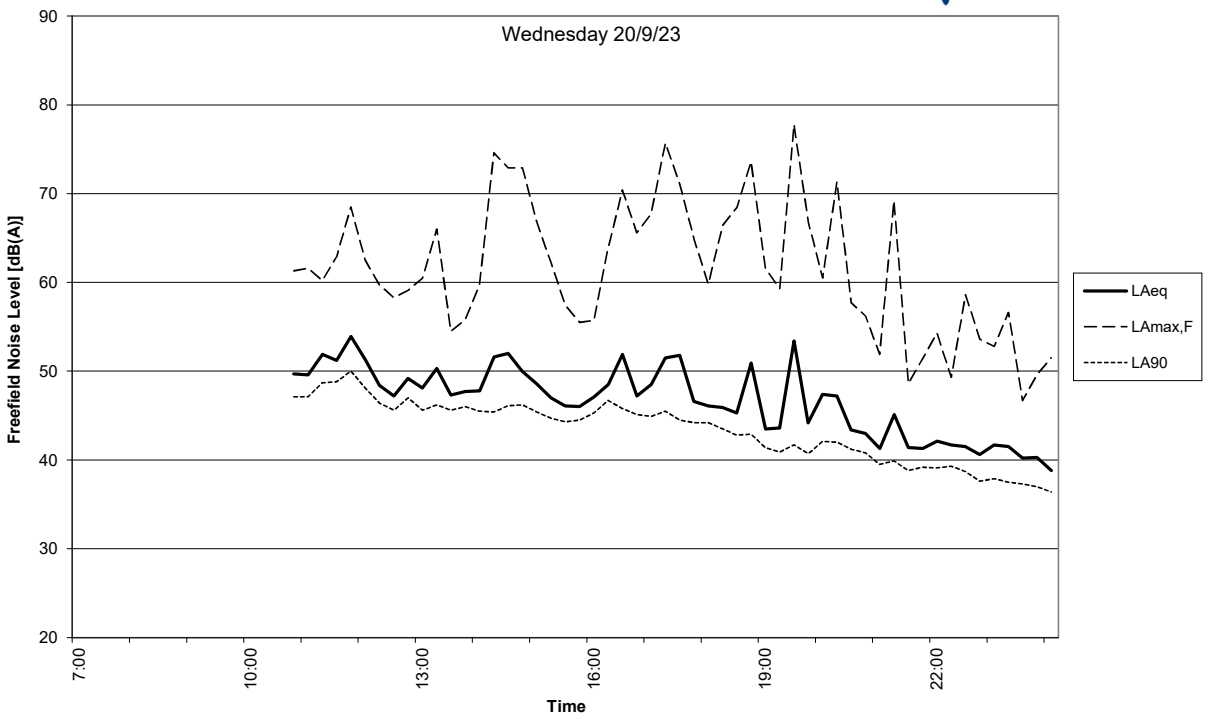
Units Used to Describe Noises Which Change Their Level with Time

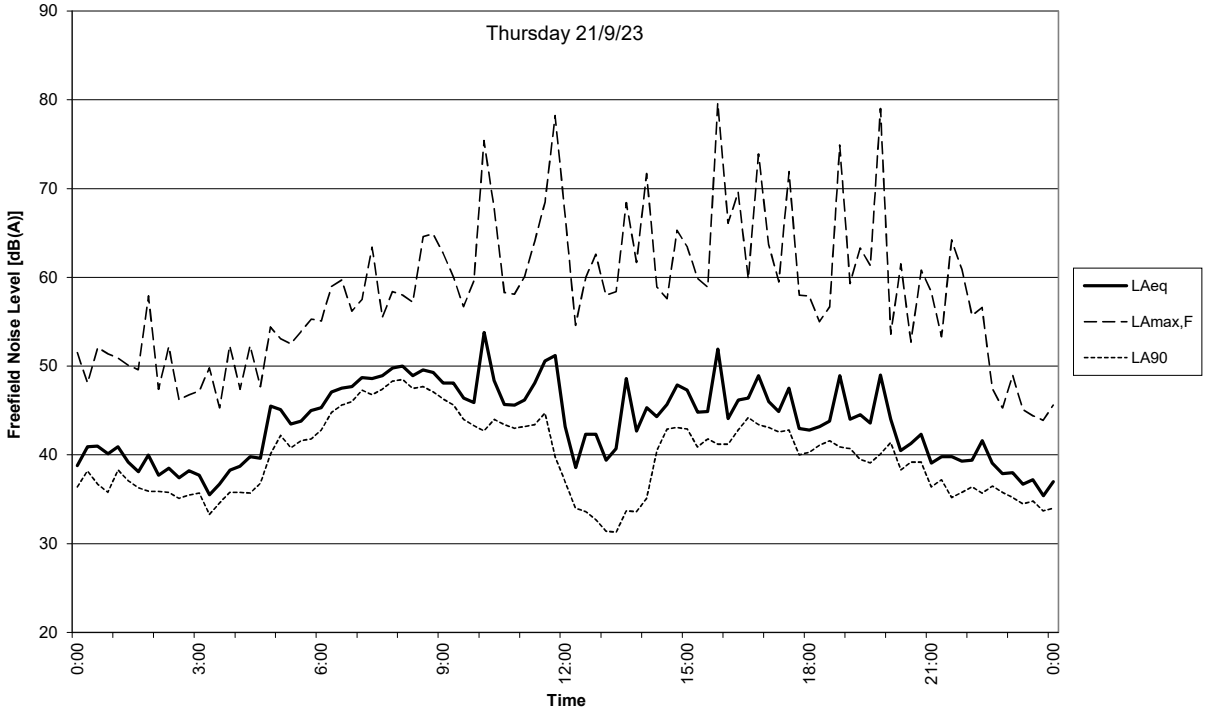
The Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is the principal measurement index for environmental noise. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quieter parts of the measurement period.

The L_{Amax} is the single maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax\,F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax\,S}$, or Slow, is averaged over 1 second. The measured L_{Amax} noise levels in this assessment are Fast.

Appendix B
Results and Analysis of Noise Monitoring at Position U1 – Trefychan Farm


Wednesday 20/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
7:00
10:00
13:00
16:00
19:00
22:00
Time
LAeq
LAmax,F
LA90


Thursday 21/9/23
Freefield Noise Level [dB(A)]
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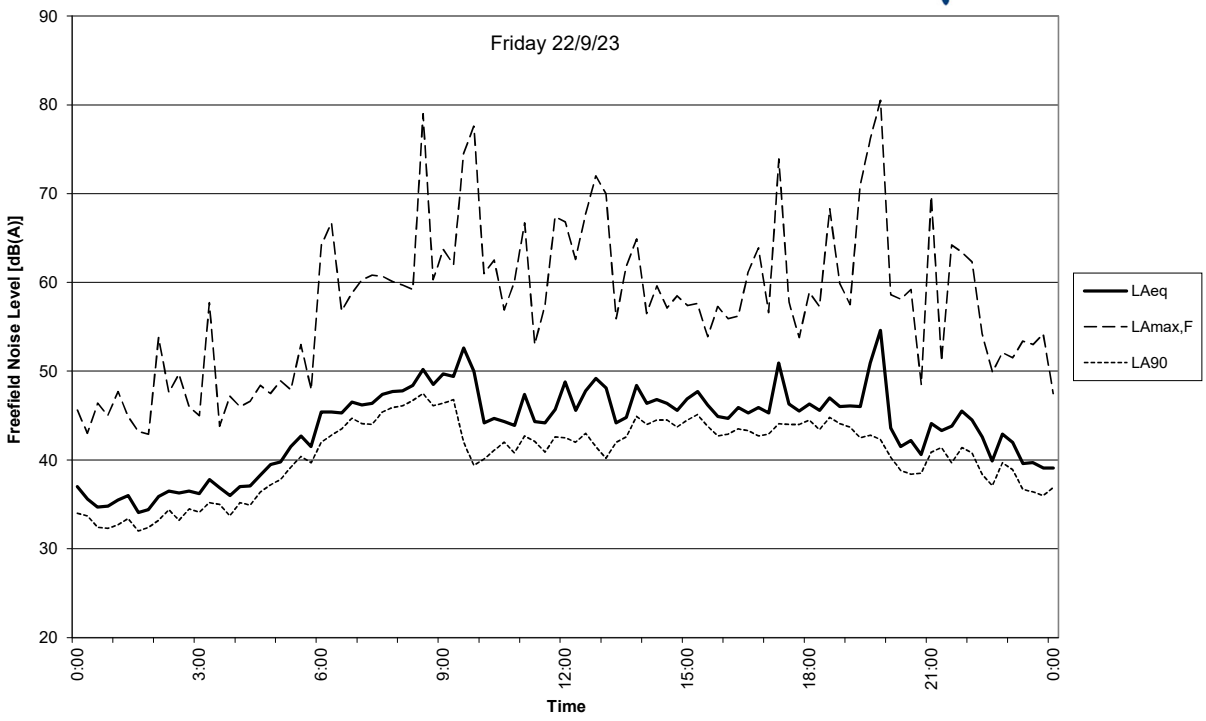
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Friday 22/9/23
Freefield Noise Level [dB(A)]
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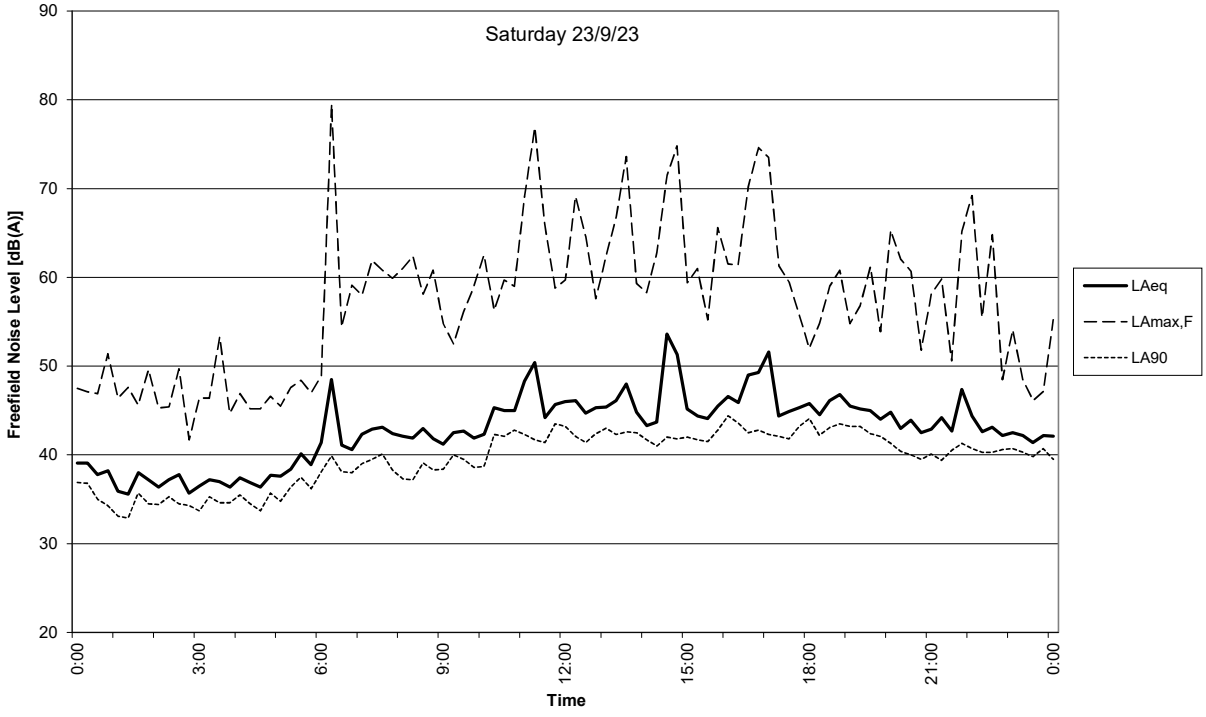
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Saturday 23/9/23
Freefield Noise Level [dB(A)]
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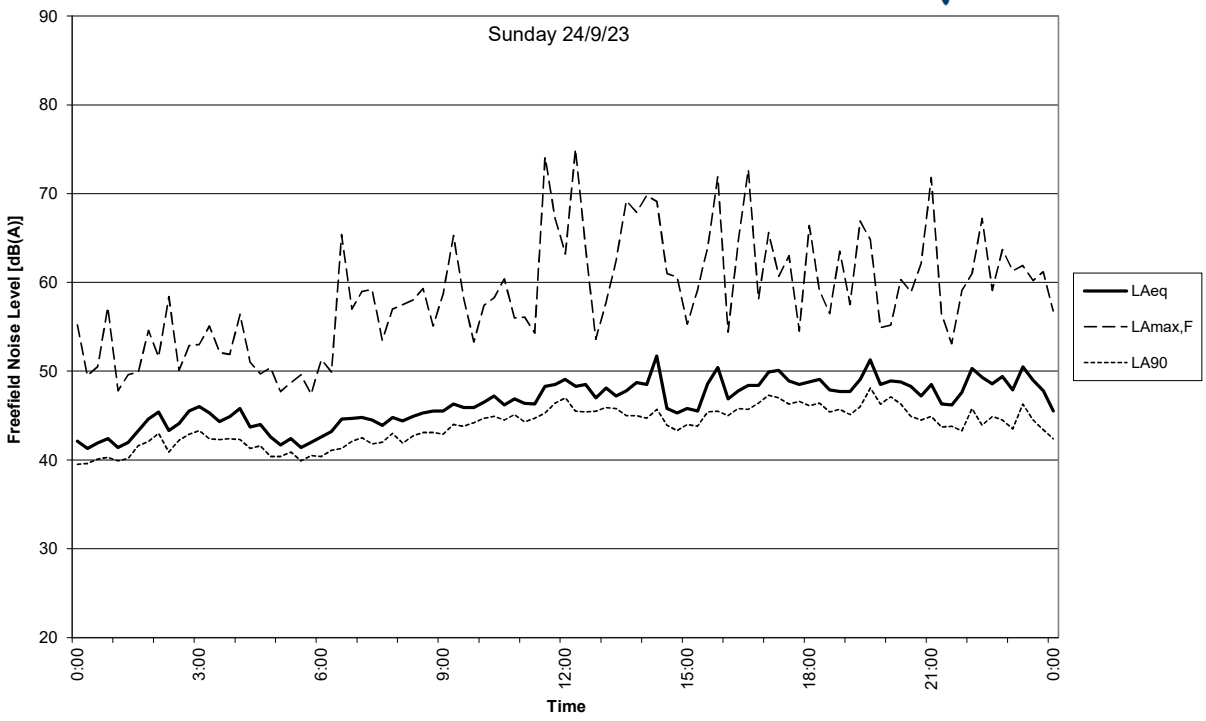
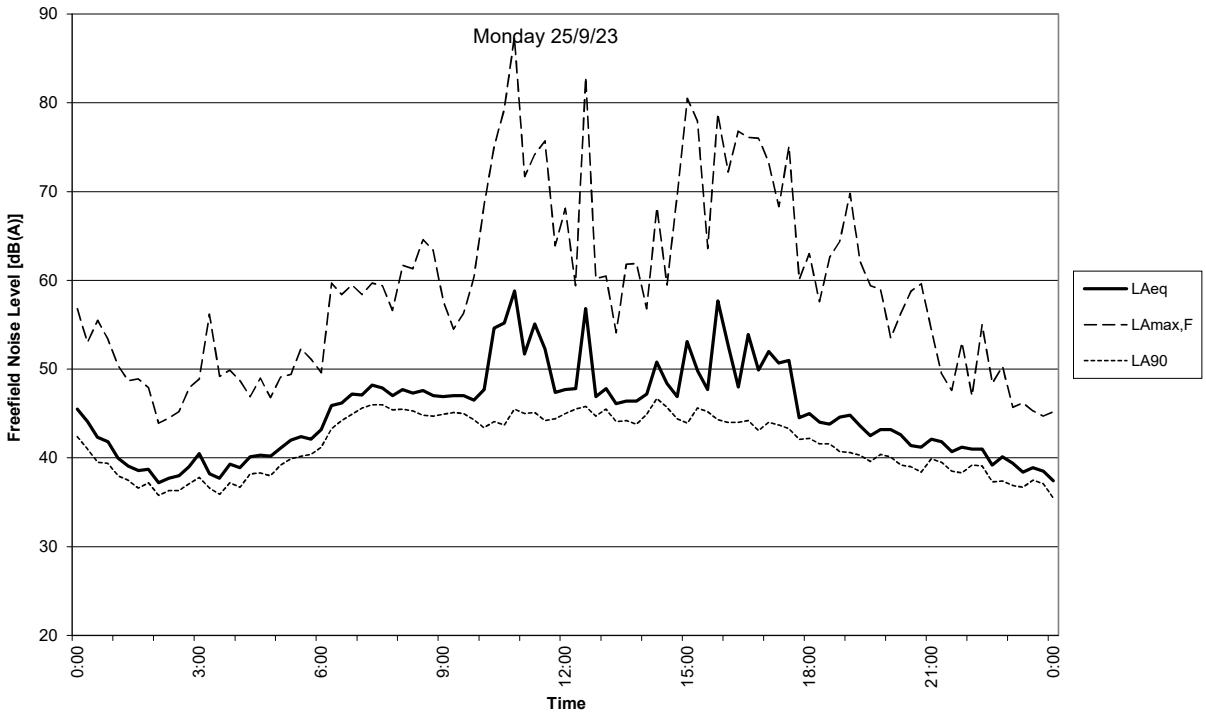
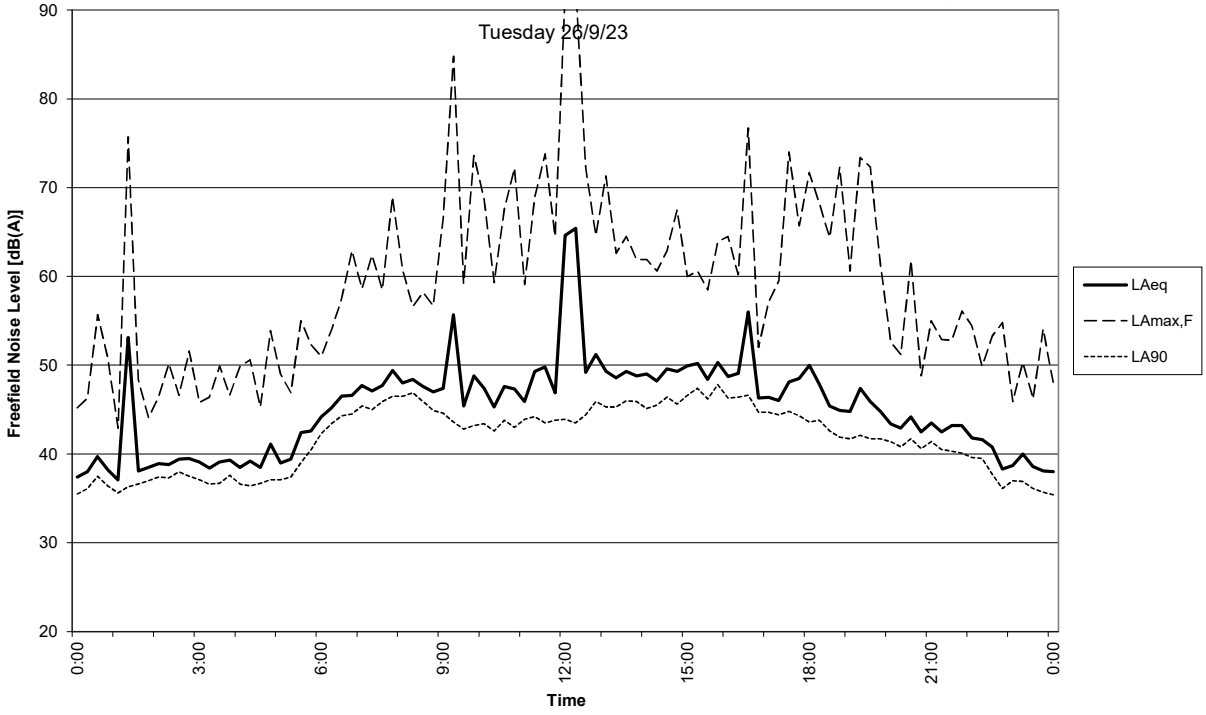
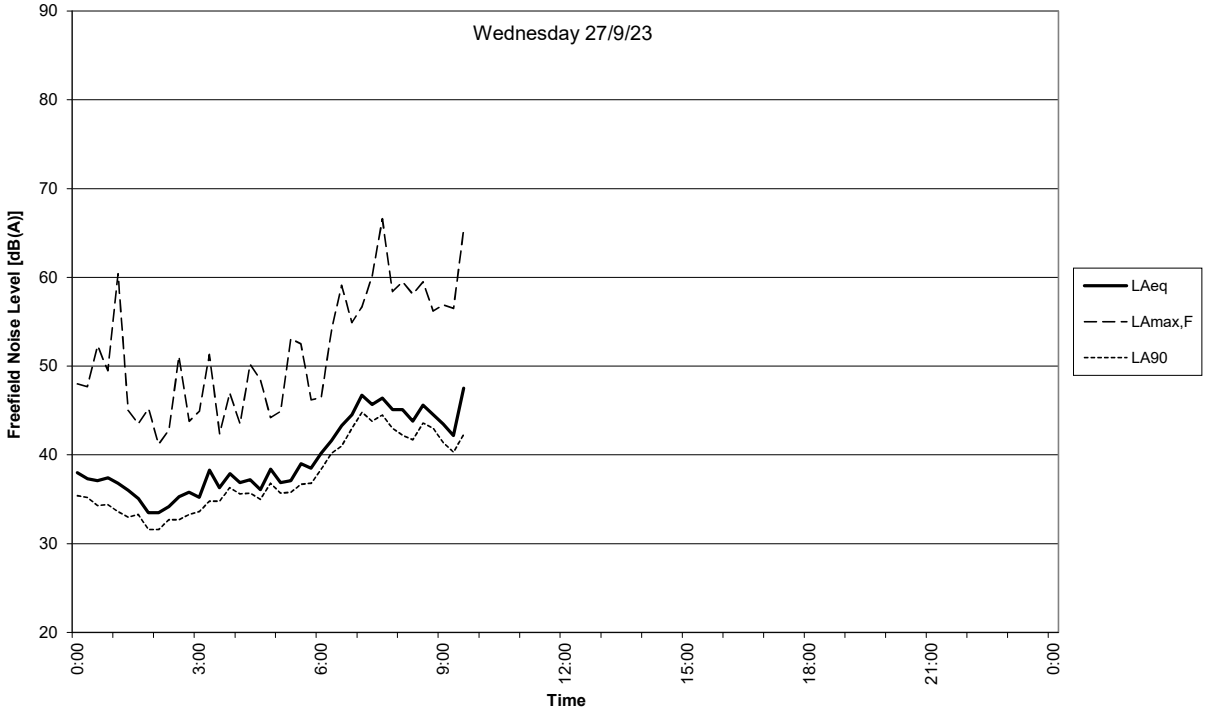
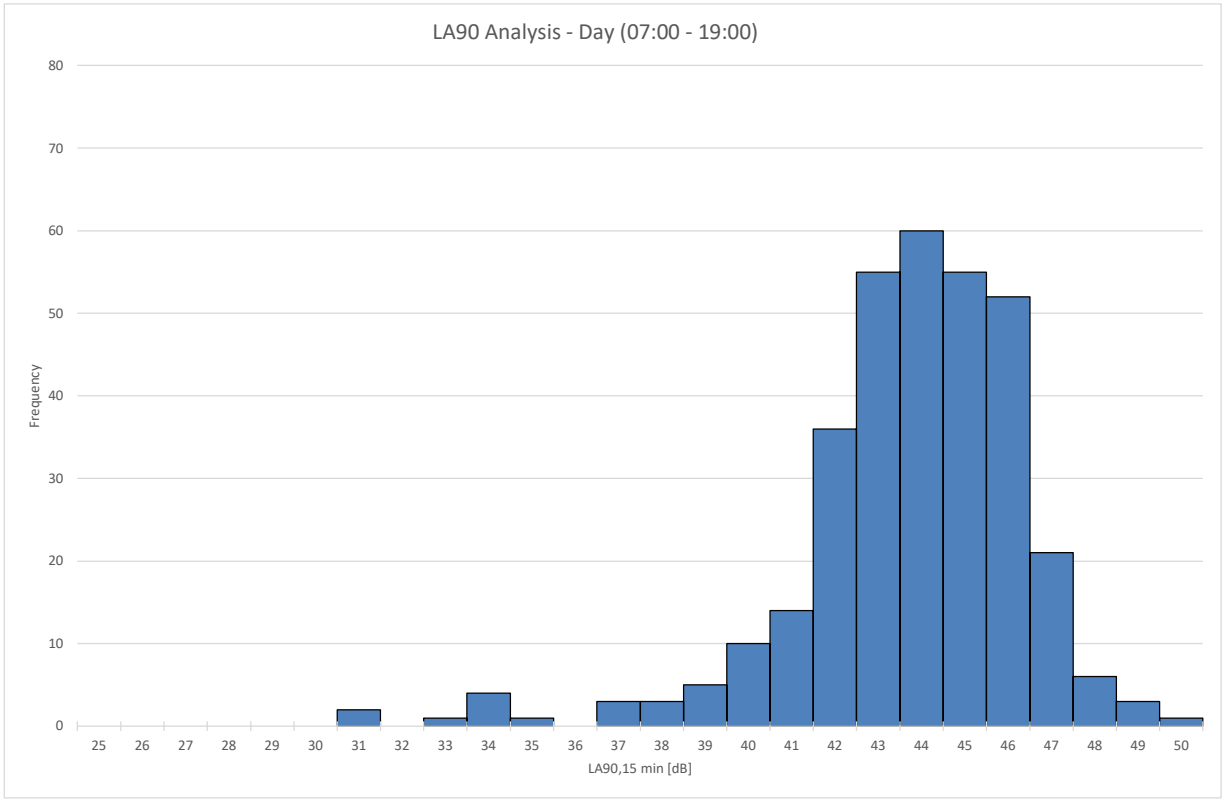
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Sunday 24/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Monday 25/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Tuesday 26/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Wednesday 27/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


LA90 Analysis - Day (07:00 - 19:00)
Frequency
LA90,15 min [dB]
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20
30
40
50
60
70
80
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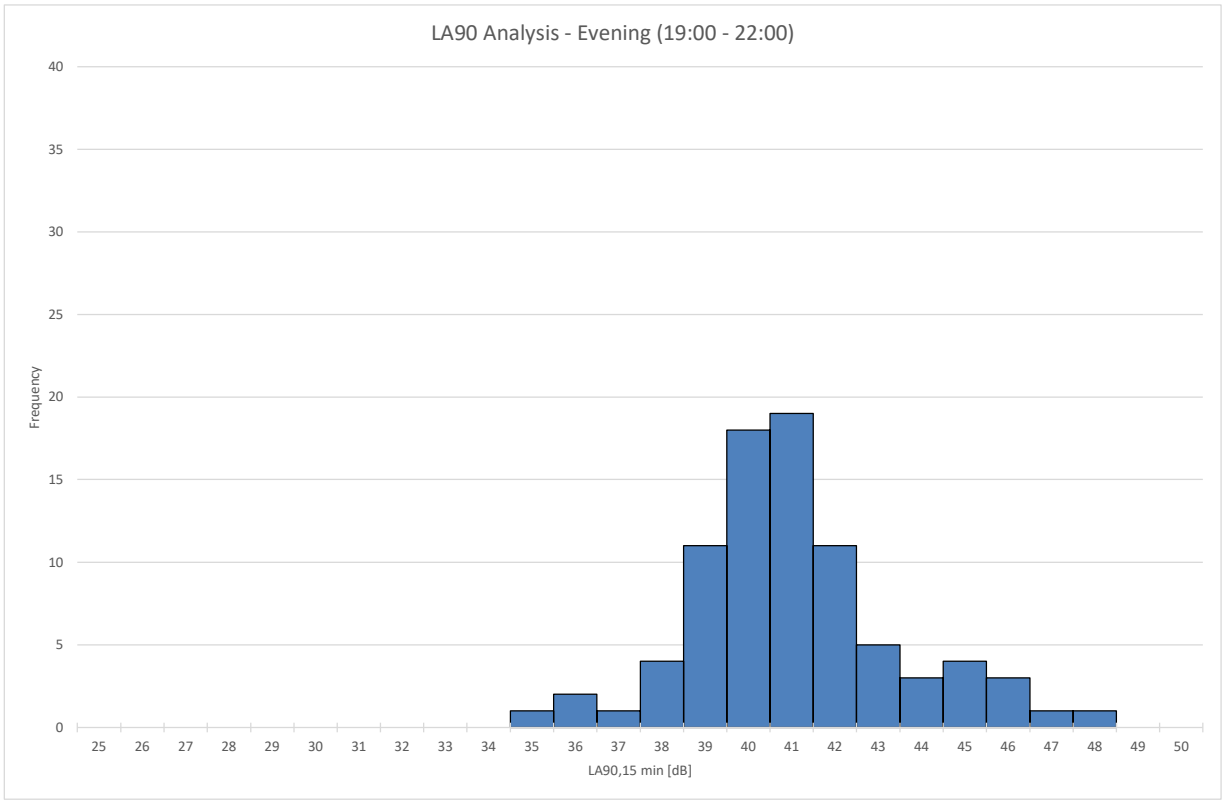
LA90 Analysis - Evening (19:00 - 22:00)
Frequency
LA90,15 min [dB]
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5
10
15
20
25
30
35
40
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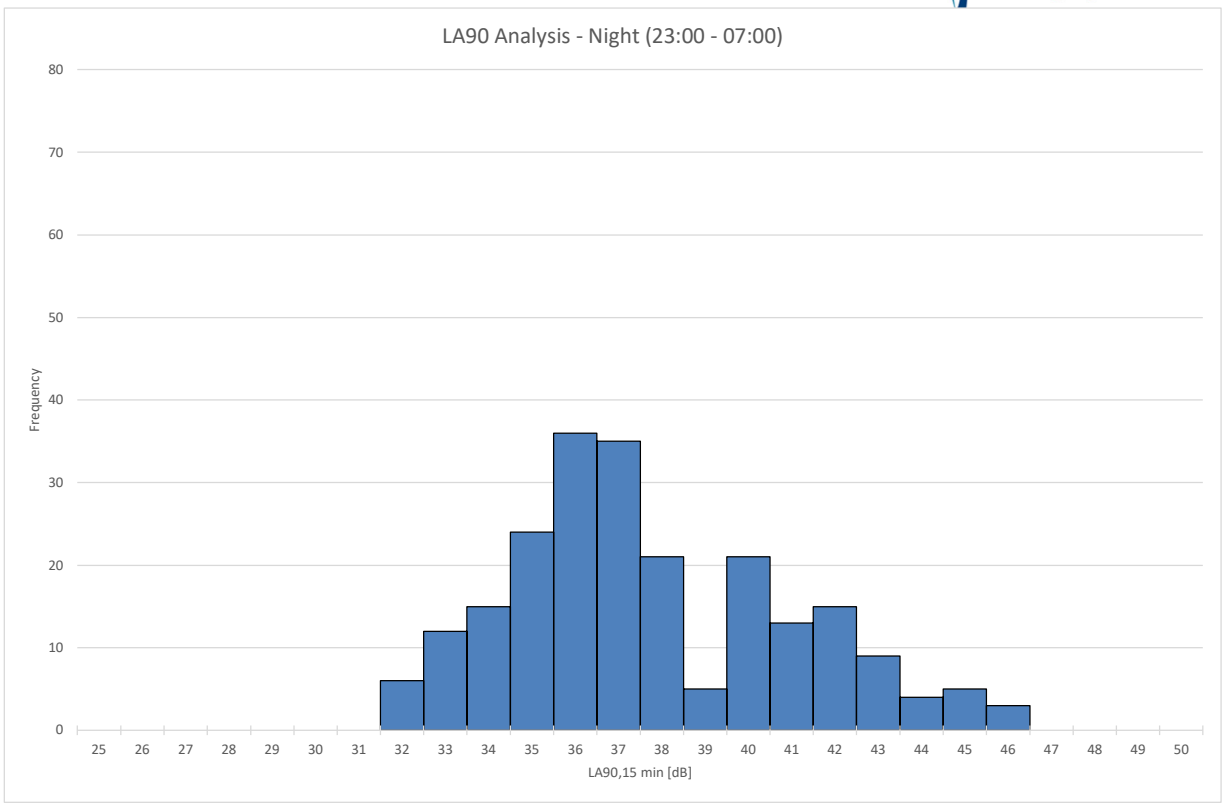
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Frequency
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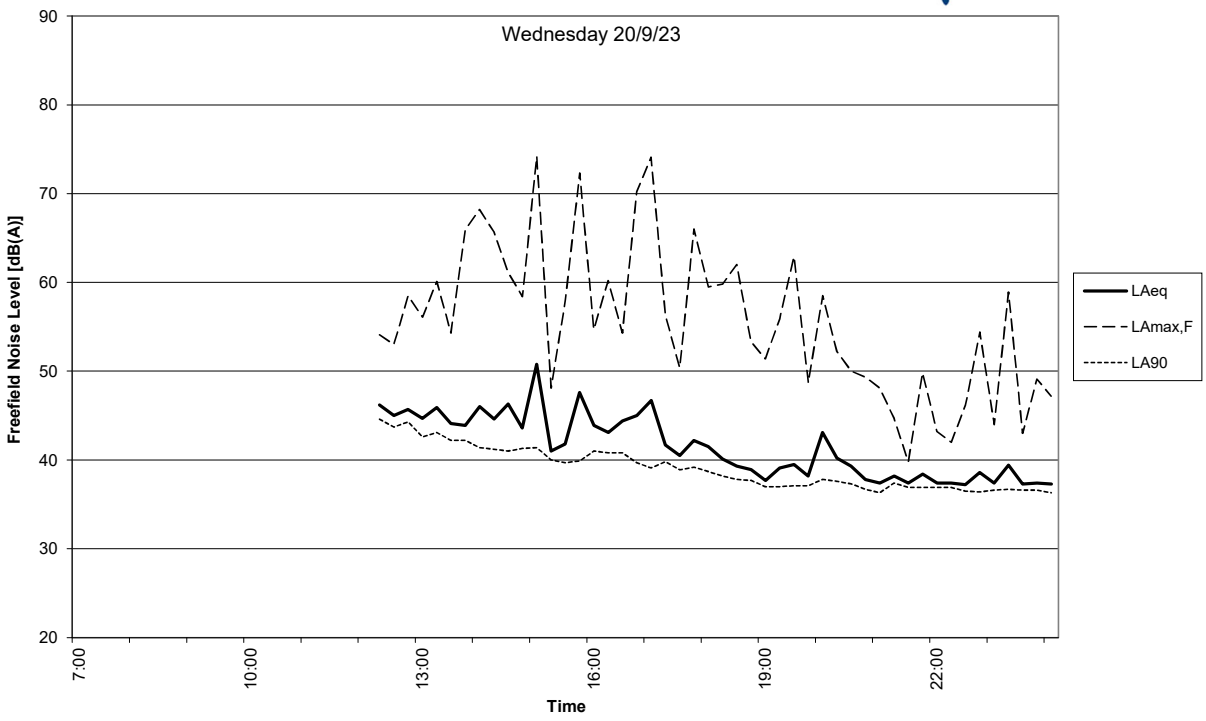
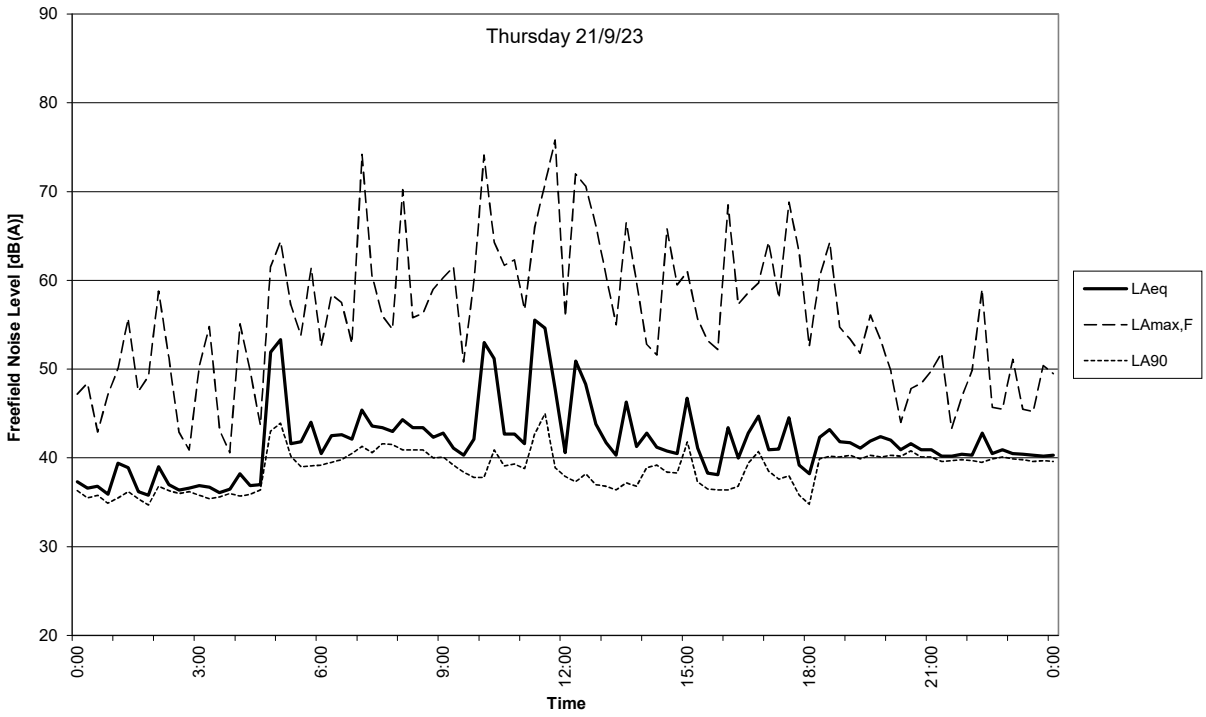
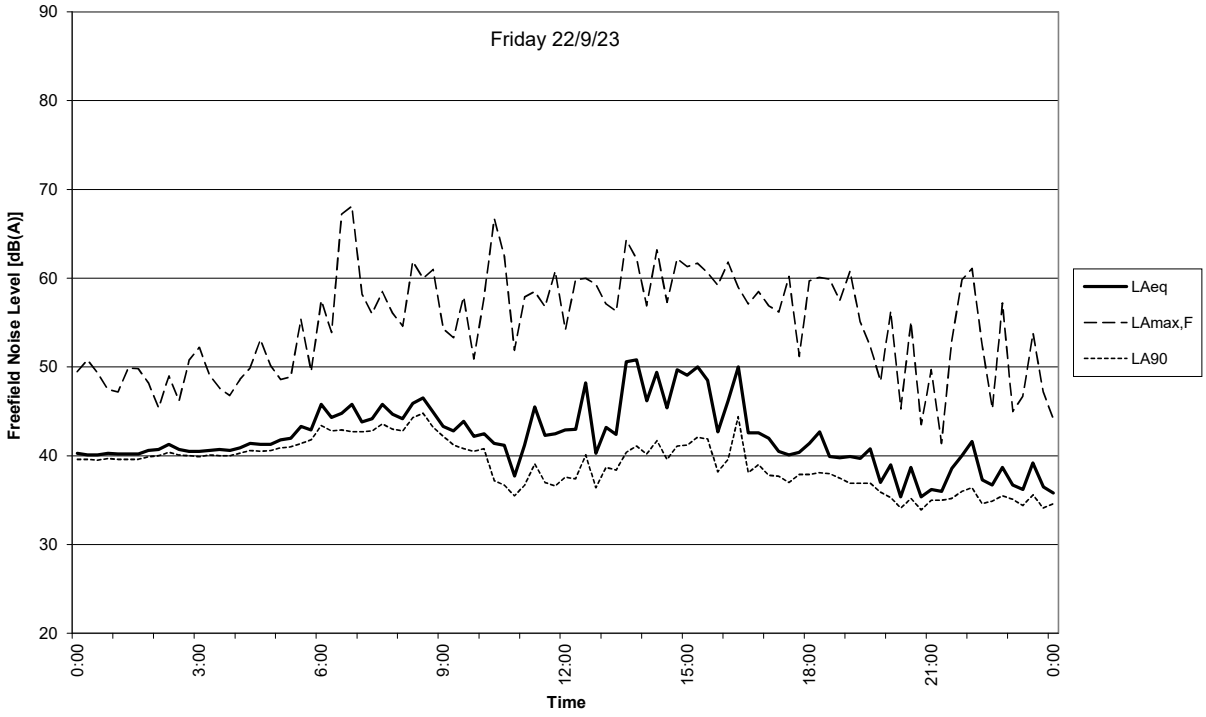
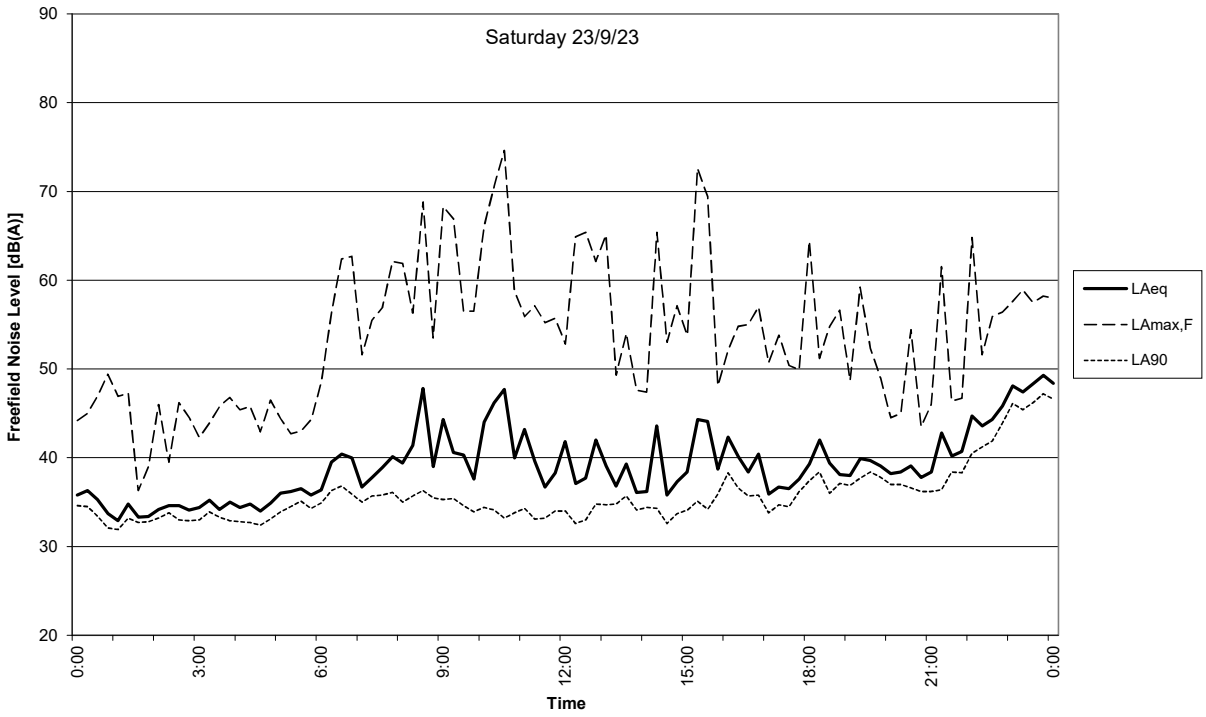
70
60
50
40
30
20
10
0
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
LA90,15 min [dB]

Appendix C
Results and Analysis of Noise Monitoring
at Position U2 – Tai'r-waun-isaf


Wednesday 20/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
7:00
10:00
13:00
16:00
19:00
22:00
Time
LAeq
LAmax,F
LA90


Thursday 21/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Friday 22/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Saturday 23/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
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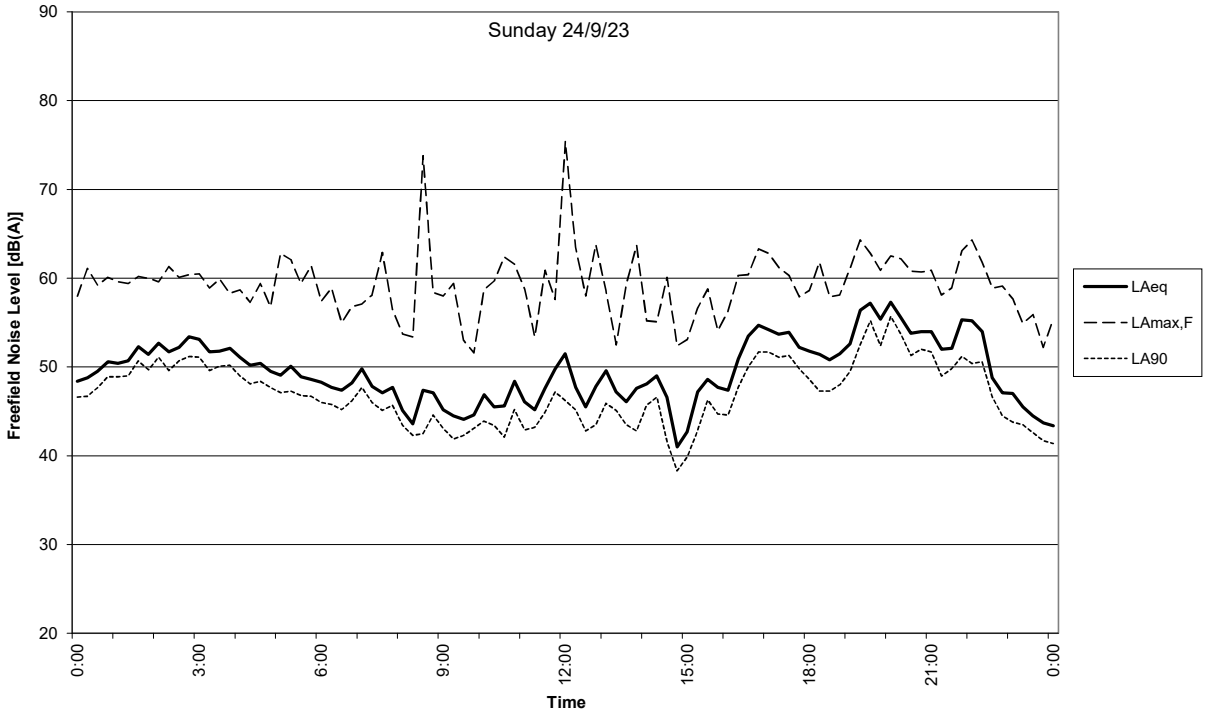
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Sunday 24/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
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30
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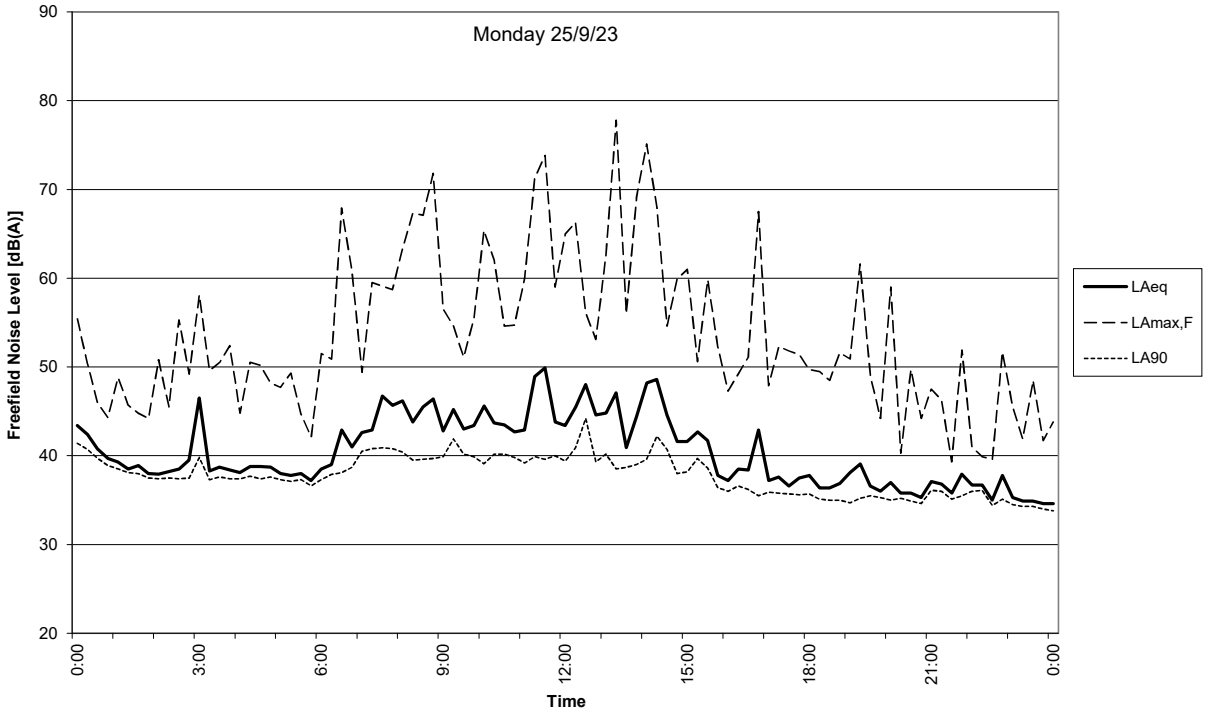
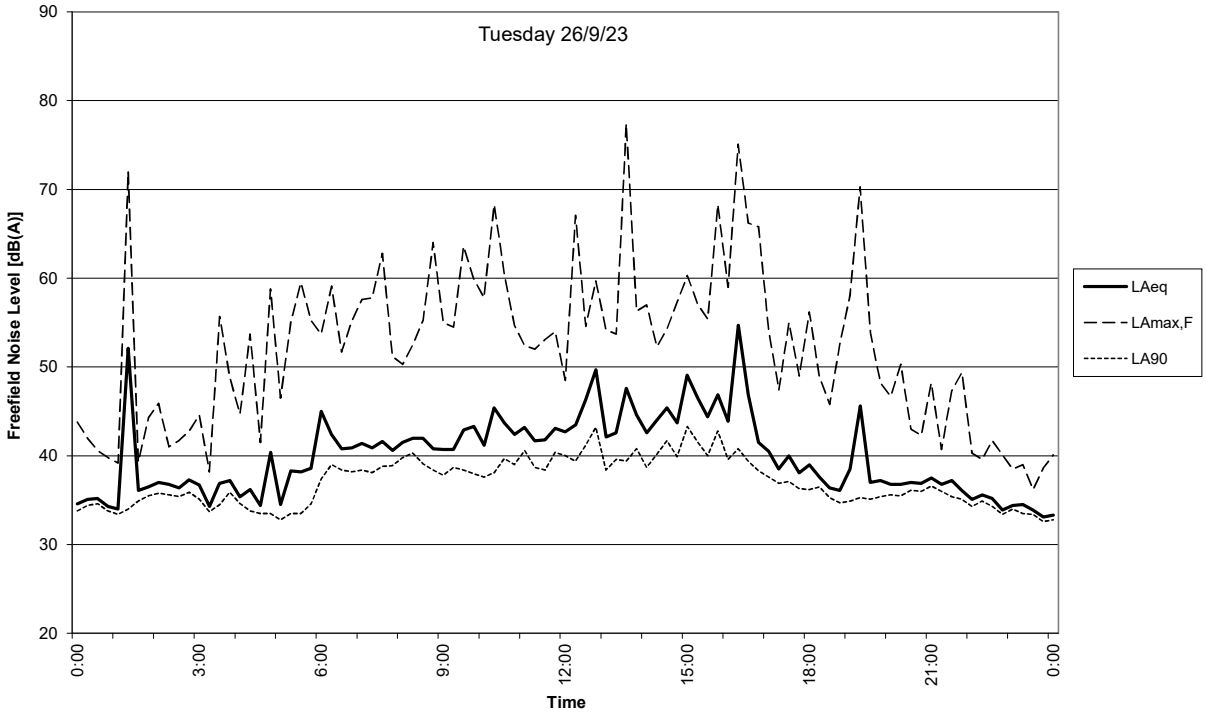
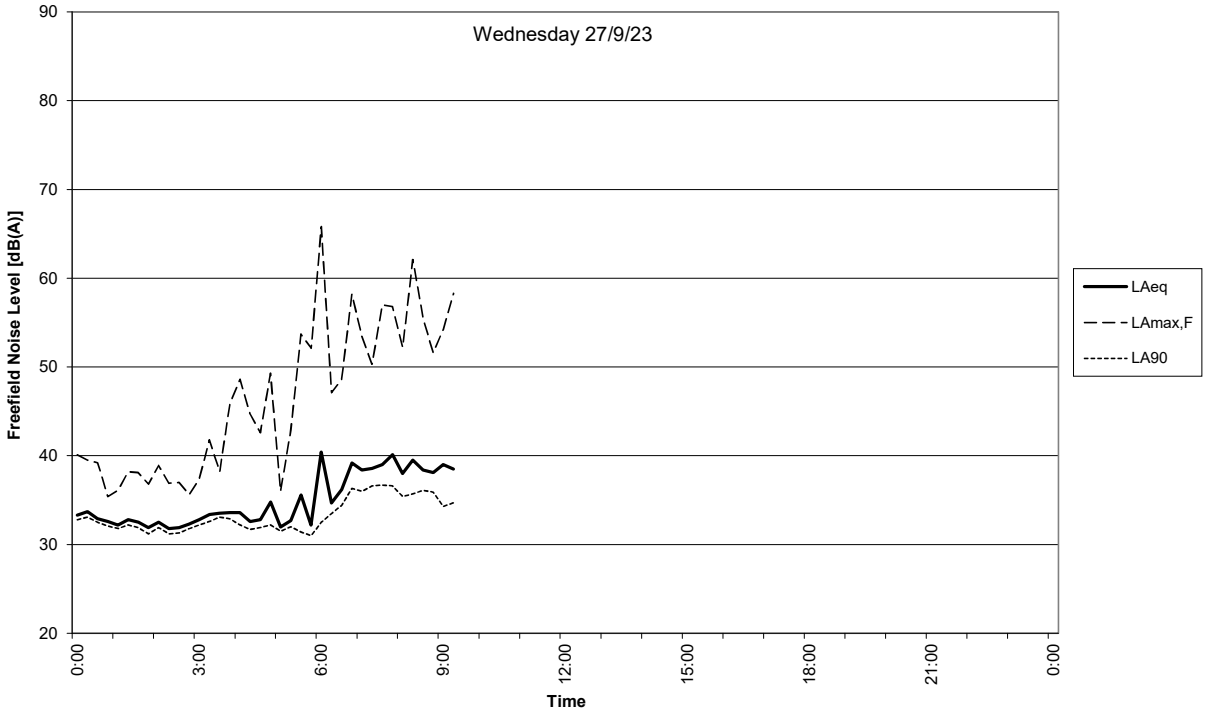
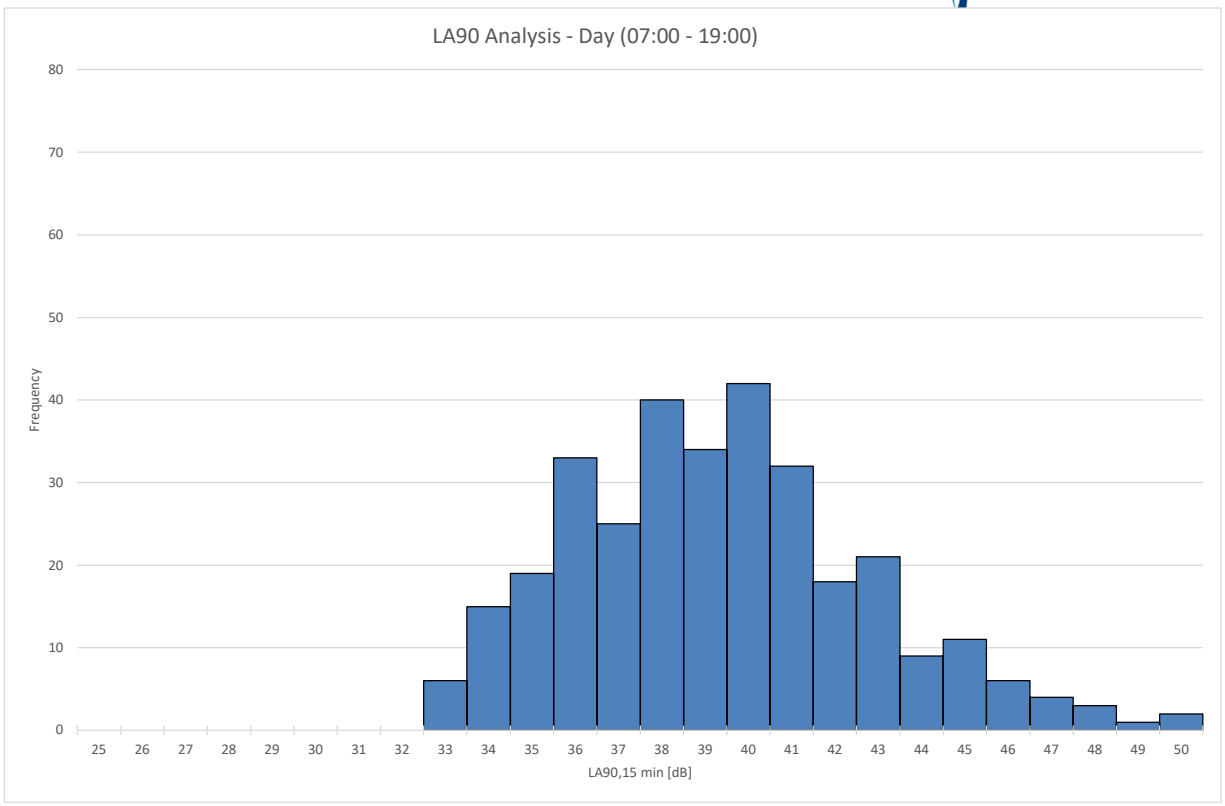
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Monday 25/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Tuesday 26/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Wednesday 27/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90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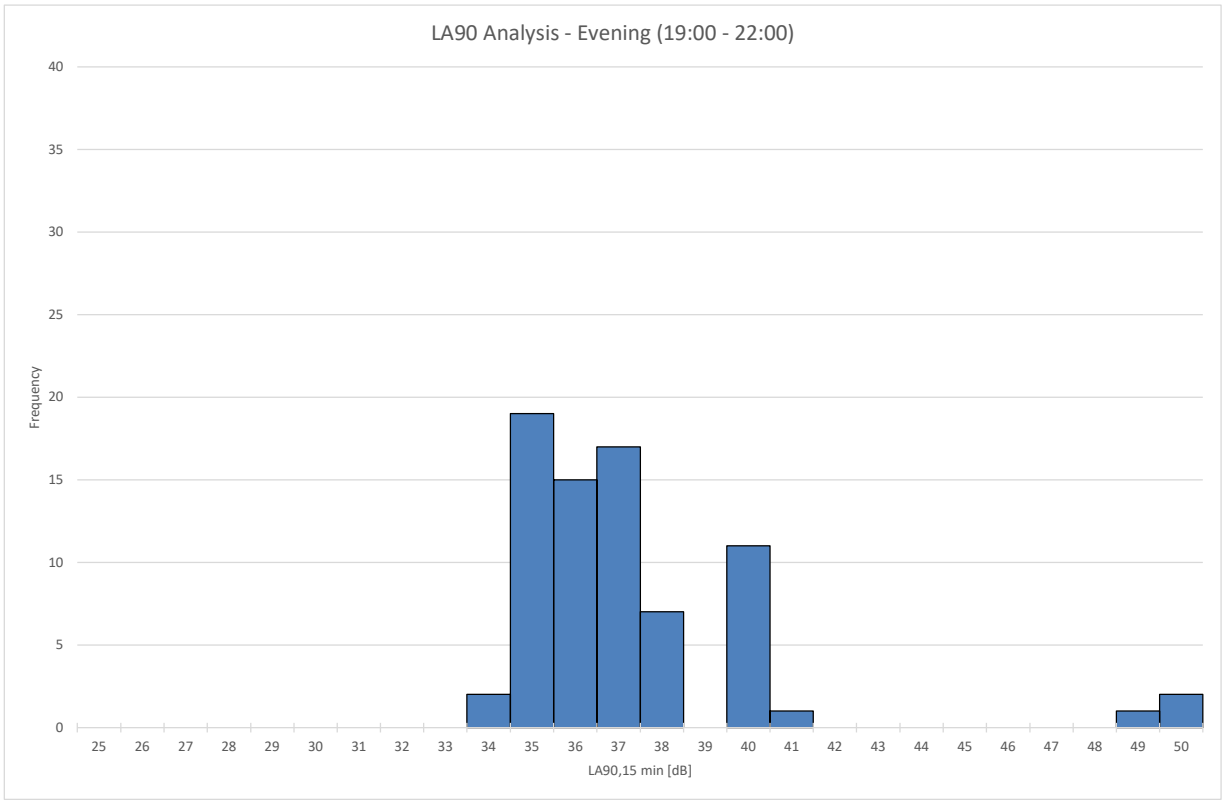
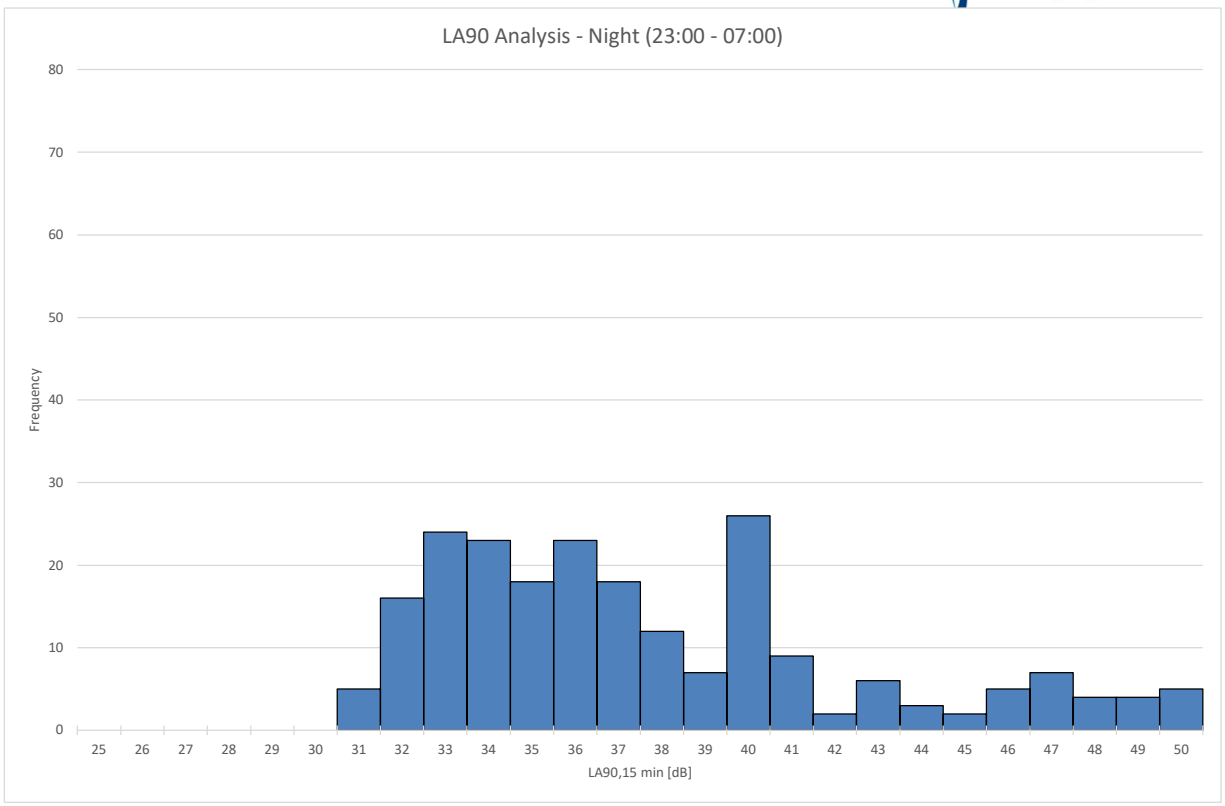
Frequency
LA90,15 min [dB]


LA90 Analysis - Evening (19:00 - 22:00)
Frequency
LA90,15 min [dB]


LA90 Analysis - Night (23:00 - 07:00)
Frequency
80
70
60
50
40
30
20
10
0
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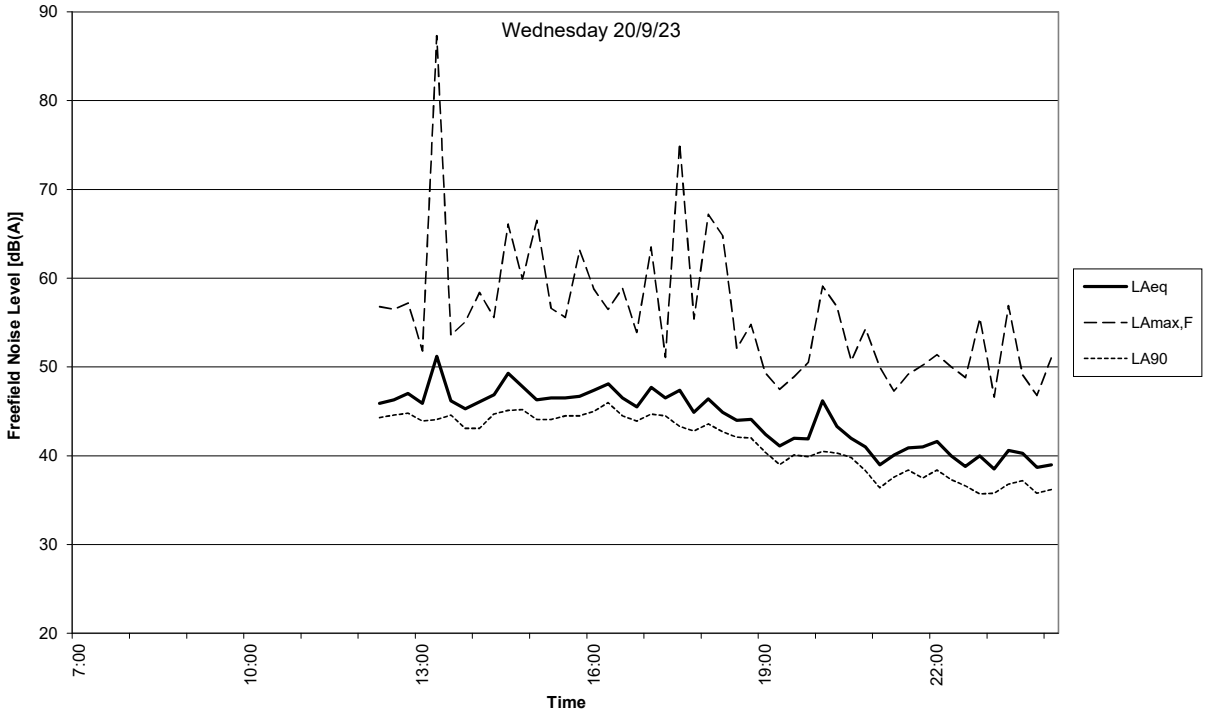
LA90,15 min [dB]

Appendix D
Results and Analysis of Noise Monitoring at Position U3 – Northern Site Boundary


Wednesday 20/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
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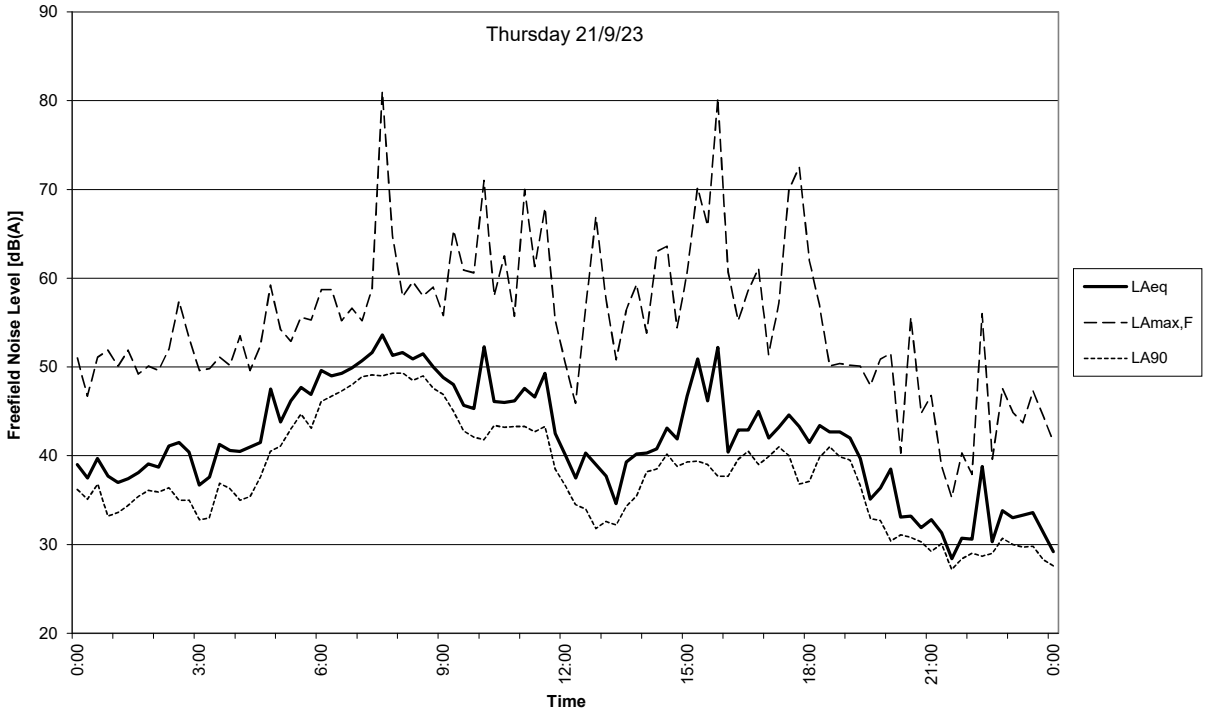
40
30
20
7:00
10:00
13:00
16:00
19:00
22:00
Time
LAeq
LAmax,F
LA90


Thursday 21/9/23
Freefield Noise Level [dB(A)]
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80
70
60
50
40
30
20
0:00
3:00
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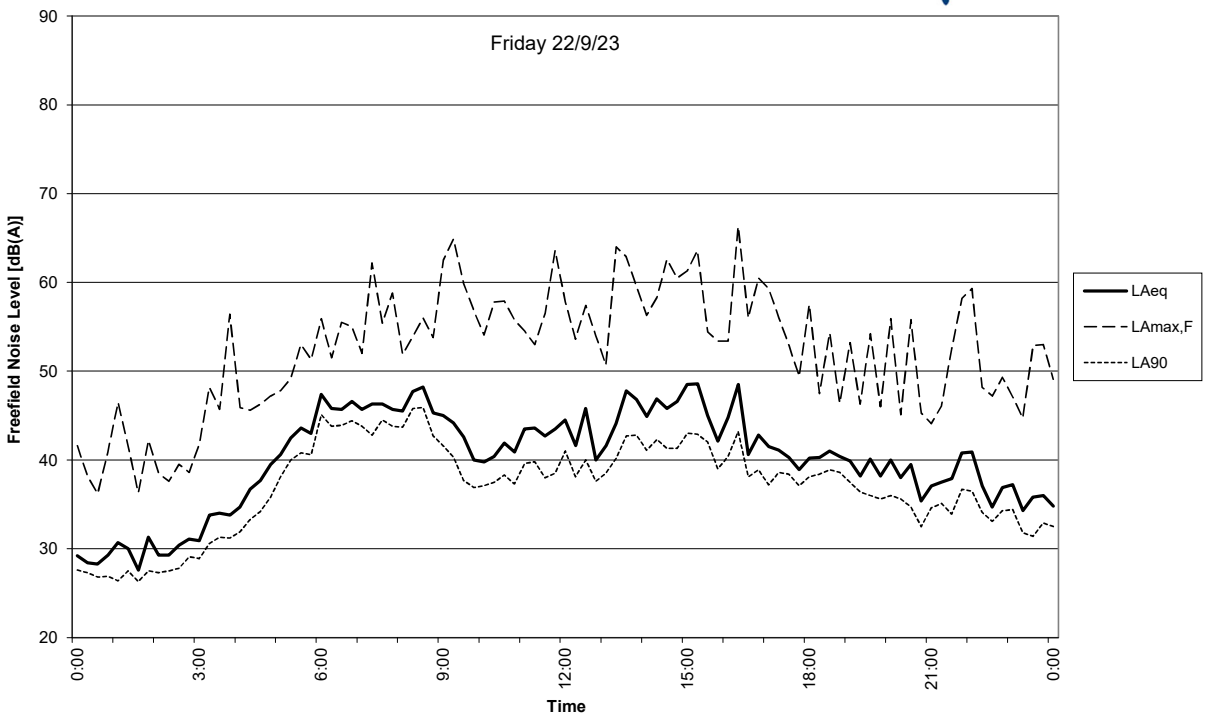
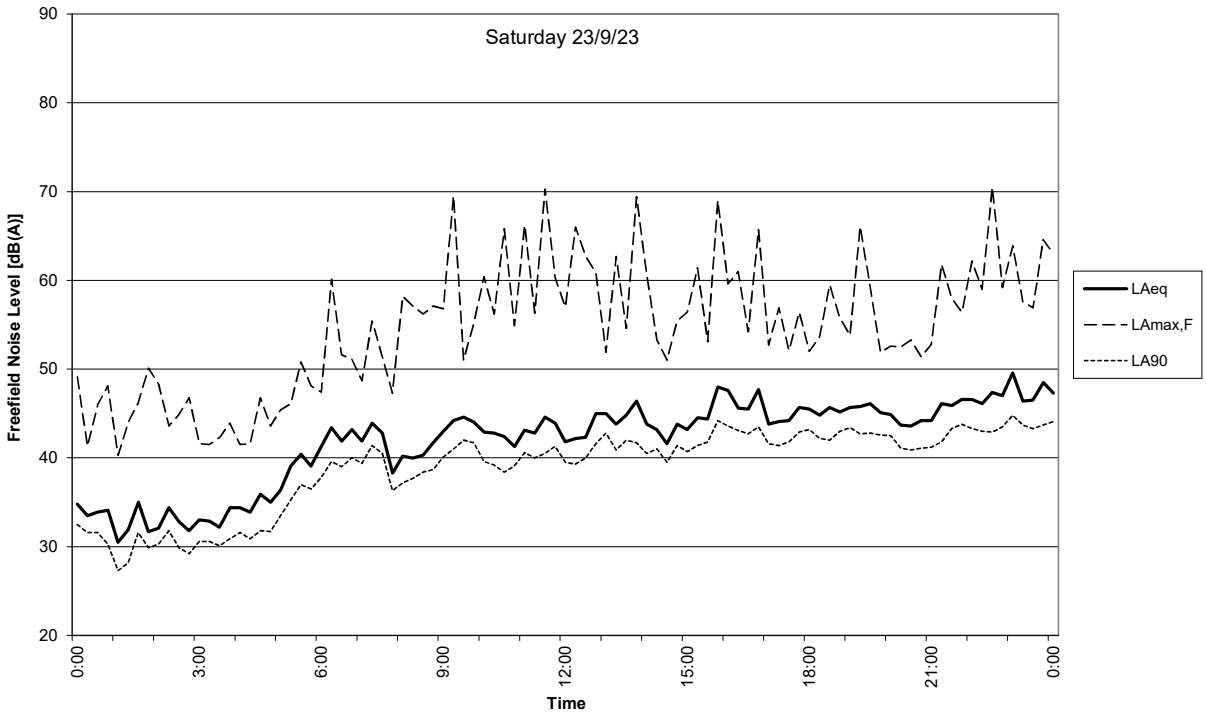
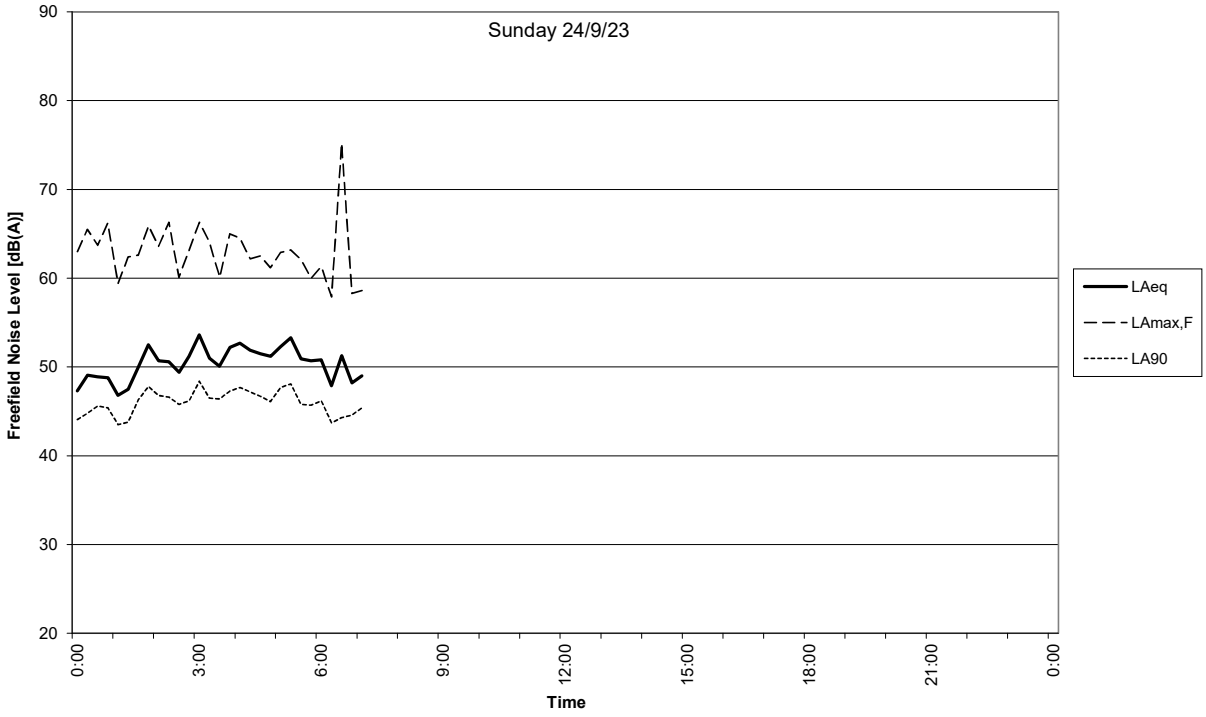
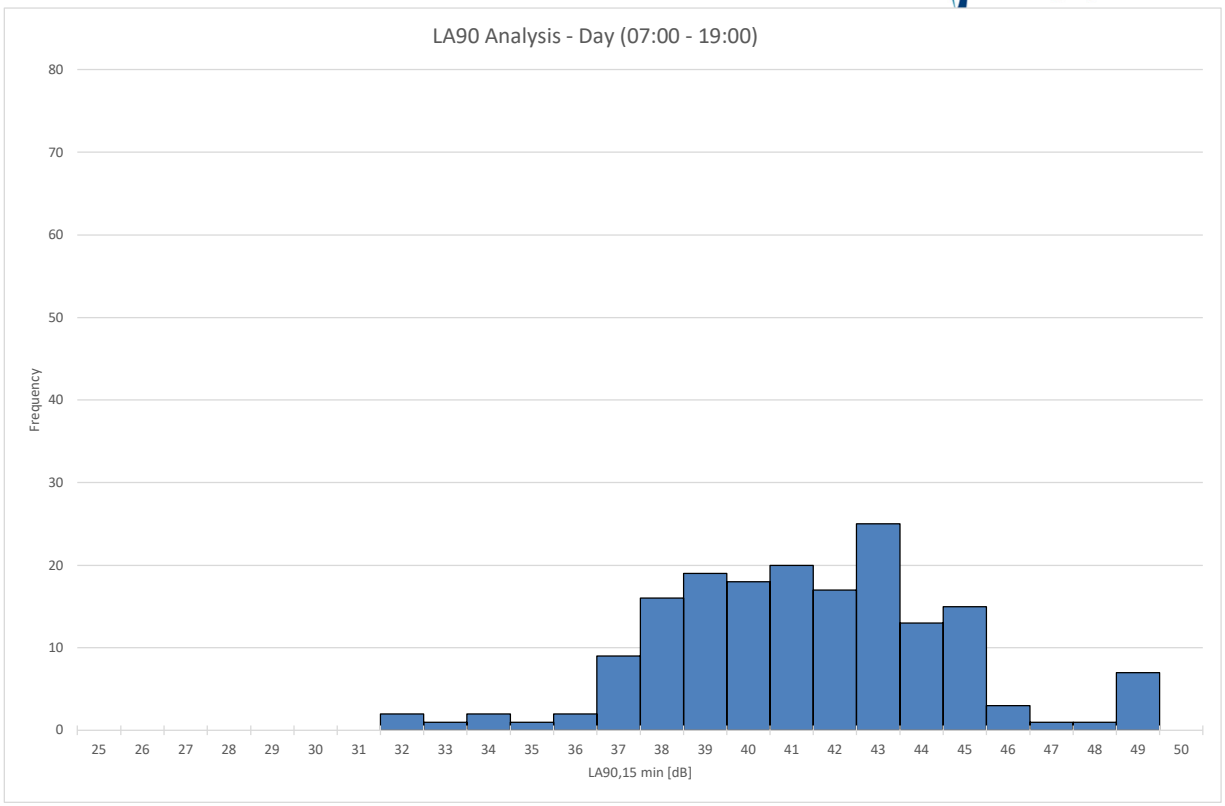
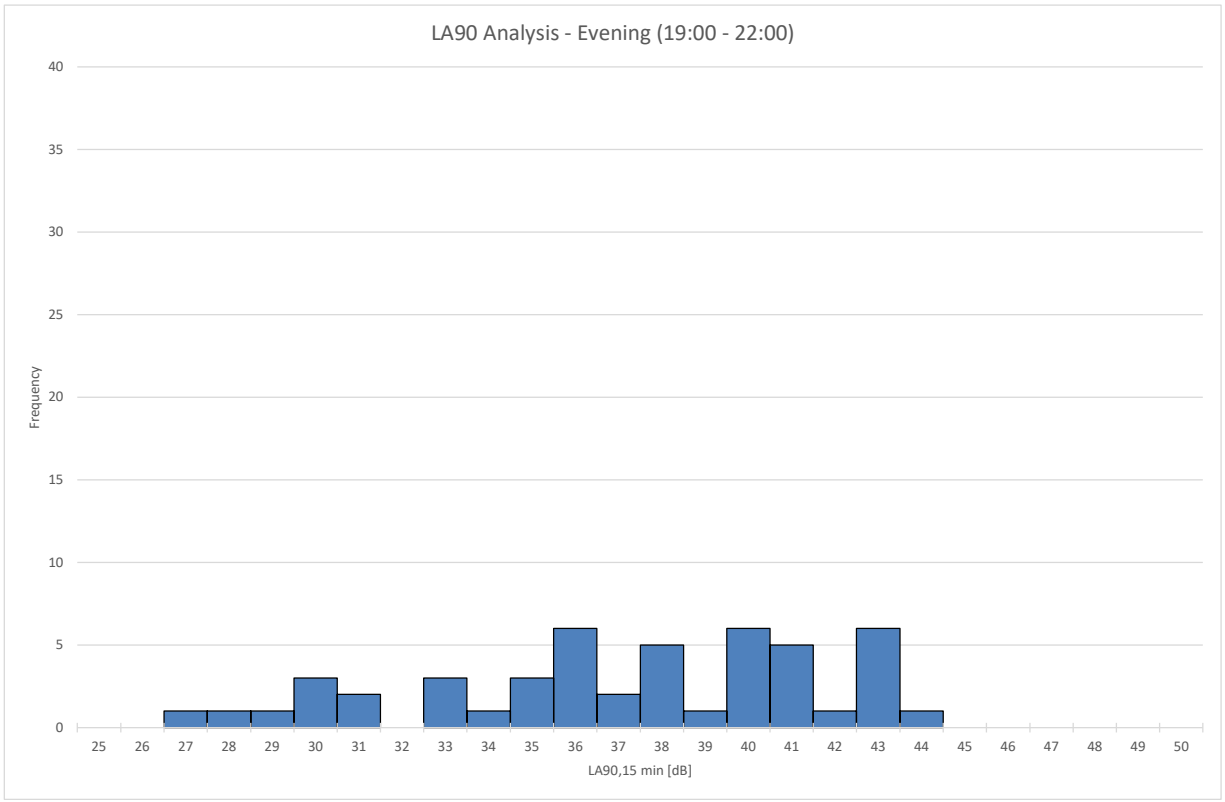
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90

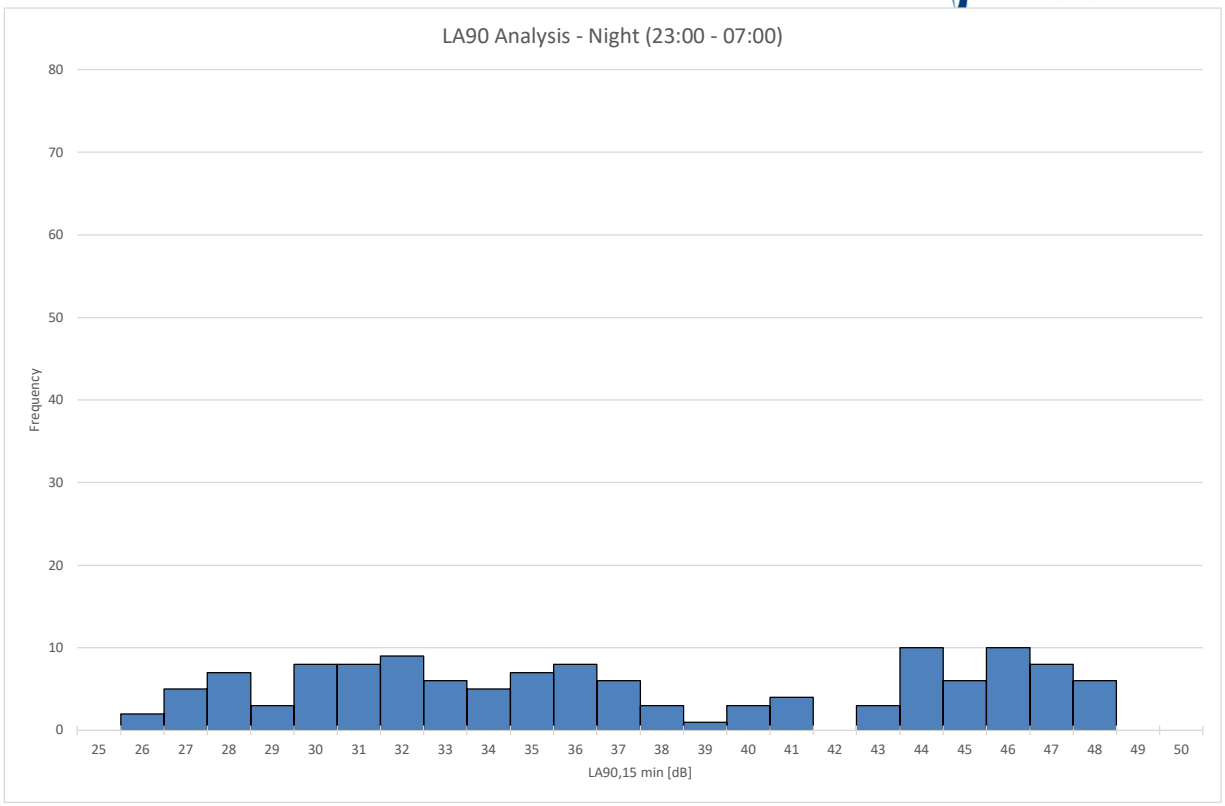

Friday 22/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Saturday 23/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


Sunday 24/9/23
Freefield Noise Level [dB(A)]
90
80
70
60
50
40
30
20
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Time
LAeq
LAmax,F
LA90


LA90 Analysis - Day (07:00 - 19:00)
Frequency
LA90,15 min [dB]


LA90 Analysis - Evening (19:00 - 22:00)
Frequency
LA90,15 min [dB]


LA90 Analysis - Night (23:00 - 07:00)
Frequency
80
70
60
50
40
30
20
10
0
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
LA90,15 min [dB]