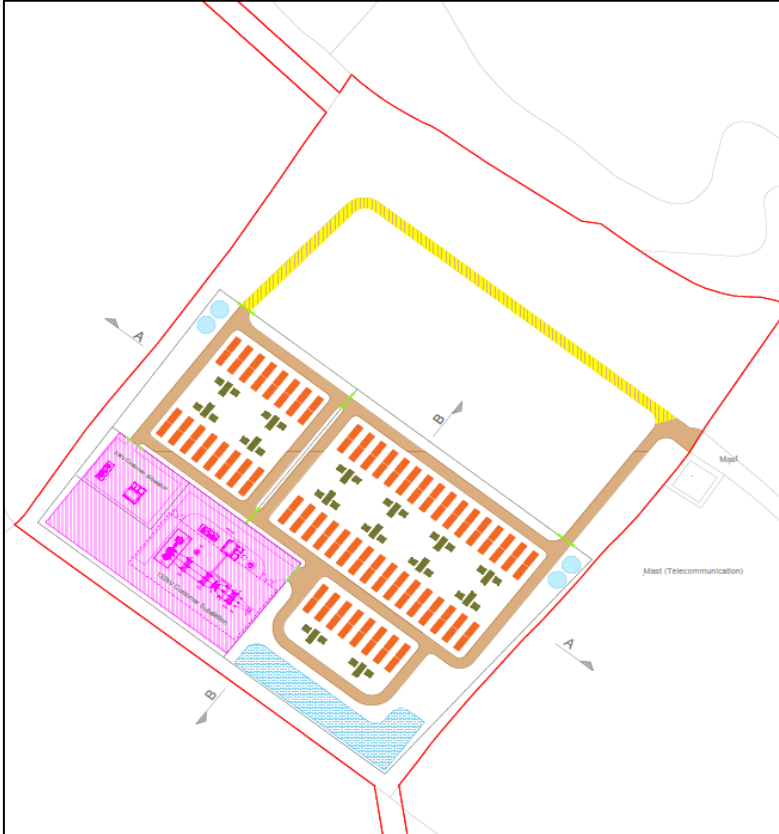

Tea Leys BESS, Staffordshire, ST10 4NS

Noise Assessment

784-B048497



Tea Leys Energy Storage Limited

April 2025

Document prepared on behalf of Tetra Tech Group Limited. Registered in England number: 6595608



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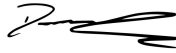
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1.0 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This report presents the findings of a noise assessment undertaken in support of a planning application for a proposed battery energy storage system (BESS) located on land at Tean Leys Farm, Tean Leys, Lower Tean, Staffordshire.

The proposed development comprises the installation of BESS units, associated infrastructure, cable route corridor and access.

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the short-term and long-term effects of noise.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A and Report Conditions are presented in Appendix E.

1.2 LEGISLATIVE CONTEXT

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in the National Planning Policy Framework (NPPF), published in December 2024. With regard to noise and planning, the NPPF contains the following statement at Paragraph 198:

“198. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- (a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- (b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason [...]*

“200. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

“201. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a

particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

Planning Practice Guidance (PPG): Noise provides further guidance with regard to the assessment of noise within the context of Planning Policy. The overall aim of this guidance, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England (NPSE), is to **“identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.”**

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated below in Table 1.1.

Table 1.1: PPG Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No Specific Measures Required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

Perception	Examples of Outcomes	Increasing Effect Level	Action
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The NPPF, NPSE and PPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents including ‘BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings’ (2014) and ‘BS 4142: 2014 Methods for Rating and Assessing Industrial and Commercial Sound’. Section 2.0 presents the noise level criteria used as a basis of this assessment.

The PPG also states that neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.

1.3 ACOUSTIC CONSULTANTS’ QUALIFICATIONS AND PROFESSIONAL MEMBERSHIPS

The initial lead project Acoustic Consultant was Neil Fletcher. The updated revision of this report has been prepared by Joseph Archer, checked by Alex Clark and verified by Dawit Abraham. Relevant qualifications, membership and experience are summarised in Table 1.2 below.

Table 1.2: Acoustic Consultants’ Qualifications & Experience

Name	Education	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
Neil Fletcher	BSc 1996 MSc 2005	Mar 2020	Mar 2020	May 2023
Joseph Archer	BSc 2015 PgDip 2022	Jun 2016	Apr 2018	-
Alex Clark	BEng 2016	Jan 2017	July 2016	March 2020
Dawit Abraham	BSc 2008 MSc 2010	Oct 2010	Jan 2011	Jan 2015

2.0 ASSESSMENT CRITERIA

2.1 NATIONAL PLANNING PRACTICE GUIDANCE

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from standards and design guidance:

- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'
- BS4142:2014+A1:2019 'Method for rating industrial and commercial sound'
- World Health Organisations (1999) Guidelines for community noise
- IEMA 'Guidelines for Environmental Noise Impact Assessment' (2014).

Table 2.1: Noise Level Criteria and Actions

Noise Sources	Noise Level Criteria	Justification for Effect Level- Action Required
No Observed Adverse Effect Level (NOAEL)		
Fixed plant and equipment located externally	Difference between Rating Level ($L_{A,r,T}$) dB and existing background level $L_{A90,T}$ dB is less than or equal to 0dB	Justification for Effect Level: Below low impact threshold in BS4142:2014 Action Required: None
Absolute internal noise criteria for the following noise sources with windows closed: • BESS Operations	Noise levels are below: Living Rooms: - 35 dBL _{Aeq,16hours} Kitchens, Dining Rooms, and Studies: - 40 dBL _{Aeq,16hours} Bedrooms: - 35 dBL _{Aeq,16hours} - 30dB $L_{Aeq,8hr}$ - $L_{AFmax,2min}$ noise levels do not exceed: 45dB L_{AFmax} based on 10 th highest $L_{AFmax,2min}$ sample)	Justification for Effect Level: Less than threshold values in Table 4 in BS8233:2014 and Table 1 in World Health Organisation (1999) Guidelines on Community Noise Action Required: None
Change in noise levels for the following noise sources: • BESS Operations	Increase in ambient $L_{Aeq,T}$ due to contribution from proposed development of ≤1dB.	Justification for Effect Level: Within negligible short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment Action Required: None
Lowest Observed Adverse Effect Level (LOAEL)		
Fixed plant and equipment located externally	Difference between Rating Level ($L_{A,r,T}$) dB and existing background sound level $L_{A90,T}$ dB is between 1-4dB.	Justification for Effect Level: Lower rating levels relative to measured background indicate it is less likely for adverse impacts to occur (depending on context). Action Required: Reduce to a minimum the exceedance over 0dB above background threshold through good acoustic design where practicable, or demonstrate contextual reasoning as to why adverse effects are not predicted

Absolute internal noise criteria for the following noise sources with windows closed: • BESS Operations	Noise levels are between: Living Rooms: - 35-40 dBL_{Aeq,16hours} Kitchens, Dining Rooms, and Studies: - 40-45 dBL_{Aeq,16hours} Bedrooms: - 35-40 dBL_{Aeq,16hours} - 30-35dB L_{Aeq,8hr} - L_{AFmax,2min} noise levels do not exceed 45dB L_{AFmax} based on 10th highest L_{AFmax,2min} sample)	Justification for Effect Level: Exceed threshold guidelines in Table 4 of BS8233:2014 and World Health Organisation (1999) Guidelines on Community Noise by no greater than 5dB to achieve <u>reasonable internal conditions</u> as defined by Note 7 to Table 1 in BS8233:2014 Action Required: Mitigate and reduce to a minimum the exceedance over the threshold
Change in noise levels for the following noise sources: • BESS Operations	Increase in ambient L_{Aeq,T} due to contribution from proposed development of 1.0-2.9dB.	Justification for Effect Level: Within minor short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment Action Required: Additional mitigation required to achieve effect of LOAEL or less.
Significant Observed Adverse Effect Level (SOAEL)		
Fixed plant and equipment located externally	Difference between Rating Level (L_{Ar,T}) dB and existing background sound level L_{A90,T} dB is between 5-9dB.	Justification for Effect Level: Within adverse impact threshold in BS4142:2014. Action Required Additional mitigation required to achieve effect of LOAEL or less.
Absolute internal noise criteria for the following noise sources with windows closed: • BESS Operations	Noise levels are between: Living Rooms: - 40-45 dBL_{Aeq,16hours} Kitchens, Dining Rooms, and Studies: - 45-50 dBL_{Aeq,16hours} Bedrooms: - 40-45 dBL_{Aeq,16hours} - 35-40dB L_{Aeq,8hr} - 45-55dB L_{AFmax,2min} based on 10th highest L_{AFmax,2min} sample)	Justification for Effect Level: Exceeds BS8233:2014 L_{Aeq,T} reasonable criteria by 5dB or exceeds L_{AFmax,2min} (10th highest sample) Action Required: Additional mitigation required to achieve effect of LOAEL or less.
Change in noise levels for the following noise sources: • BESS Operations	Increase in ambient L_{Aeq,T} due to contribution from proposed development of 3.0-4.9dB.	Justification for Effect Level: Within moderate short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment Action Required: Additional mitigation required to achieve effect of LOAEL or less.
Unacceptable Observed Adverse Effect Level (UOAE)		
Fixed plant and equipment located externally	Difference between Rating Level (L_{Ar,T}) dB and existing background sound level L_{A90,T} dB is equal to or greater than 10dB	Justification for Effect Level: Within significant adverse impact threshold in BS4142:2014 Action Required: Additional mitigation required to achieve effect of LOAEL or less.
Absolute internal noise criteria for the following noise sources with windows closed: • BESS Operations	Noise levels exceed: Living Rooms: - 45 dBL_{Aeq,16hours} Kitchens, Dining Rooms, and Studies: - 50 dBL_{Aeq,16hours}	Justification for Effect Level: Exceeds BS8233:2014 L_{Aeq,T} reasonable criteria by 10dB or exceeds L_{AFmax,2min} (10th highest sample) by 10dB or more. Action Required:

	Bedrooms: - 45 dBL_{Aeq,16hours} - 40dB L_{Aeq,8hr} - L_{AFmax,2min} noise levels exceeds 55dB L_{AFmax} based on 10th highest L_{AFmax,2min} sample)	Additional mitigation required to achieve effect of LOAEL or less.
Change in noise levels for the following noise sources: • BESS Operations	Increase in ambient L _{Aeq,T} due to contribution from proposed development of ≥5.0dB.	Justification for Effect Level: Within major short-term impact classification range in Table 7.14 in IEMA 2014 guidance Guidelines for Environmental Noise Impact Assessment. Action Required: Additional mitigation required to achieve effect of LOAEL or less.

3.0 ASSESSMENT METHODOLOGY

3.1 NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict noise levels at a number of locations both horizontally and vertically. CADNA noise modelling software has been used. This model is based on ISO 9613-2 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically. The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in the table below have been used.

Table 3.1: Modelling Parameters Sources and Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	DEFRA	LiDAR topographical survey data – 1m DTM
Building heights – around site	Tetra Tech Observations	8 m height for two storey residential properties, and 4 m for Bungalows.
Receptor positions	Tetra Tech	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties. 4.0 m height for model grid and monitoring locations for validation.
Proposed Plans	Island Green Power	Drawing Title: Tean Leys BESS Site Layout Drawing No: v.5 Dated: 31/03/2025
Ground Absorption	Tetra Tech	G = 0.8 (soft ground)
Order of Reflections	Tetra Tach	3 no.
Modelling Methodology	CadnaA	3D noise propagation model ISO 9613-2

It is acknowledged that a number of the values of parameters chosen will affect the overall noise levels presented in this report. However, it should be noted that the values used, as identified above, are worst-case.

3.2 MODEL INPUT DATA

3.2.1 Fixed Plant Noise Data

The primary sources of noise from the operational development are listed below:

- 2 no. Substation Transformer
- 96 no. Battery Storage Units
- 14 no. Central Inverters

The frequency spectra data used in the modelling is presented in Appendix B. Third-octave band data has been provided for the battery storage units, broad-band data has been provided for the Inverter units and substation transformer and a typical third-octave band spectrum has been applied for the purposes of modelling. The battery storage units and inverters are modelled as building area sources scaled to the respective dimensions of each unit. The substation transformer is modelled as a point source at a height of 3m. The battery storage facility will operate 24 hours a day according to demand.

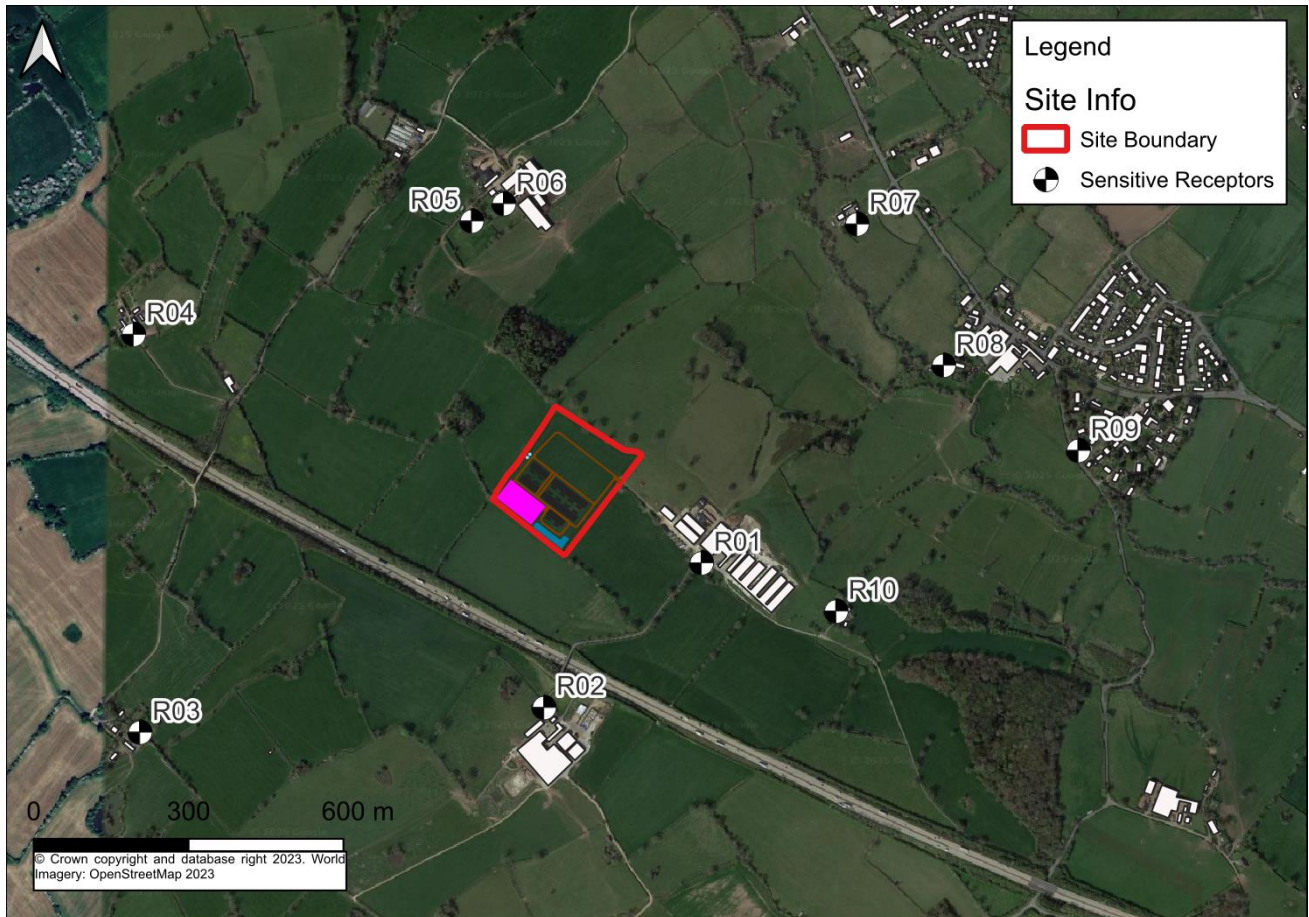
3.3 SENSITIVE RECEPTORS

Table 3.2 below summarises receptor locations that have been selected to represent worst-case sensitive receptors with respect to direct noise from the site. Façades of the nearest noise sensitive properties to the development site have been represented. The locations of the receptors are shown in Figure 3.1 below.

Table 3.2: Existing Receptor Locations

Ref.	Description	Type of Use	Height (m) Daytime / Night-time
R01	Tea Leys Farm	Residential	1.5/4.0
R02	Lower Tea Leys Farm	Residential	1.5/4.0
R03	Blythe House	Residential	1.5/4.0
R04	Highfields Farm	Residential	1.5/4.0
R05	Hillside Croft	Residential	1.5/4.0
R06	Benthouse Farm	Residential	1.5/4.0
R07	Hall Green Farm	Residential	1.5/4.0
R08	Riverside Cottages	Residential	1.5/4.0
R09	1 Nightingale Close	Residential	1.5/4.0
R10	Hillcrest House	Residential	1.5/4.0

Figure 3.1: Sensitive Receptor Locations



4.0 NOISE SURVEY

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

Rion NL52	Environmental Noise Analyser	s/n	00219905
Rion NL52	Environmental Noise Analyser	s/n	01221576
Rion NL52	Environmental Noise Analyser	s/n	00732146
Rion NL52	Environmental Noise Analyser	s/n	1021257
Rion NC75	Sound Calibrator	s/n	35046823

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice, a drift of +0.1 dB was observed on meter s/n 00219905 and 00732146, -0.1dB on meter s/n 1021257, and no drift was observed on meters s/n 01221576. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

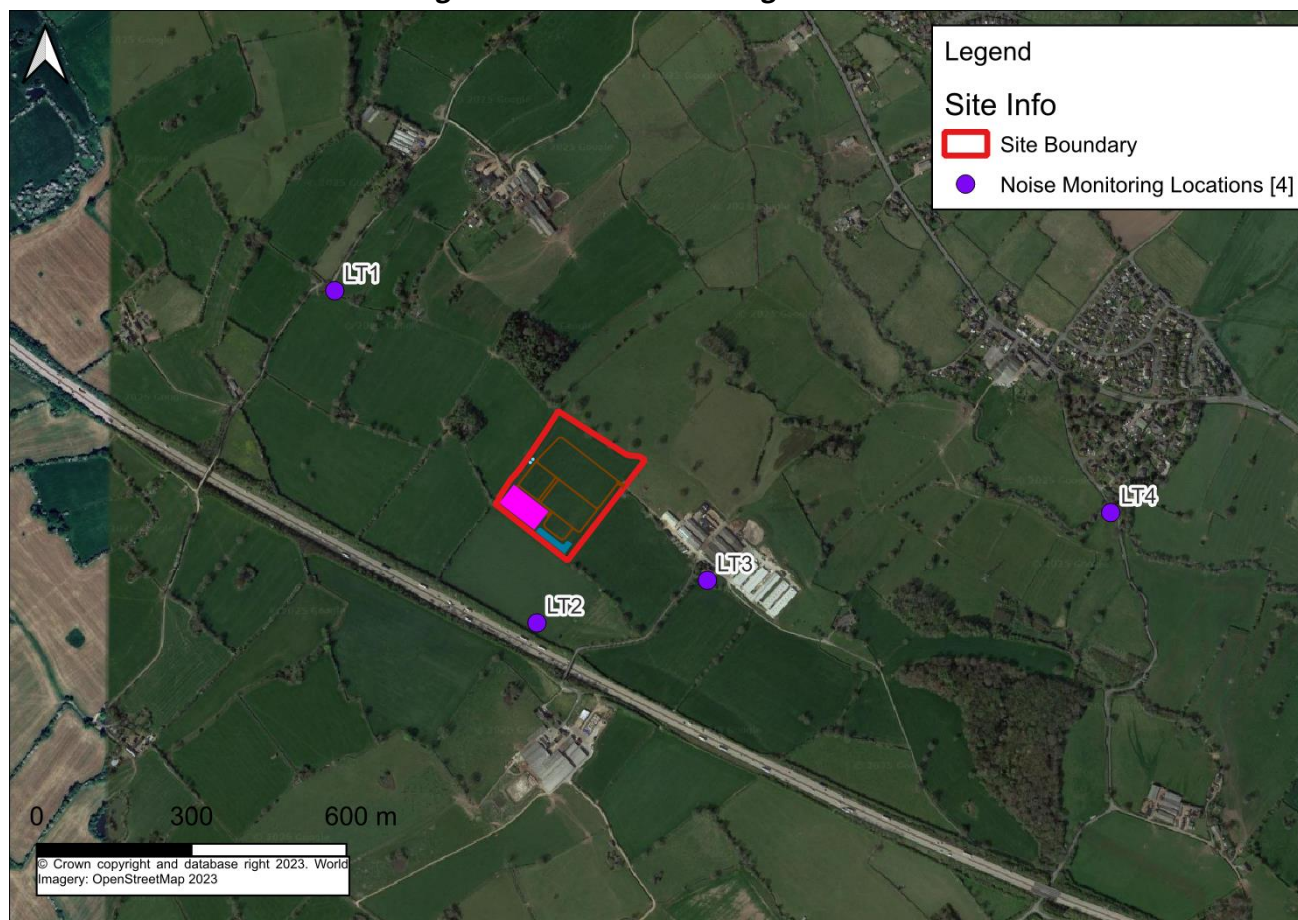
A baseline monitoring survey was undertaken at four locations (as specified in Table 4.1 and shown in Figure 4.1 below) from Wednesday 28th June 2023 to Wednesday 5th July 2023. Four long-term (LT) locations were measured unattended over a 167-hour period. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the survey period were observed as being dry. Anemometer readings confirmed that wind speeds were less than 5 ms⁻¹ at all times during the survey, with a predominant north-eastern wind direction during the survey. The attended noise monitoring meteorological conditions are presented below in Table 4.2.

Table 4.1 Noise Monitoring Locations

Ref	Description
LT1	Located South of Benthouse Farm, ST10 4JW
LT2	Located South west of Tea Leys Farm, North of the A50, ST10 4NS
LT3	Located South of Tea Leys Farm, ST10 4NS
LT4	Located South of Glenwood, Leigh Lane, ST10 4LW

Figure 4.1: Noise Monitoring Locations



Not to scale
OS Licence No. AL553611

4.1 NOISE SURVEY RESULTS

The dominant noise sources found in the area include road traffic noise from the A50 and agricultural noise. Other contributions to the ambient noise environment consist of birdsong and trees rustling in the wind.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5 minute measurement over the stated survey period.

Table 4.2: Meteorological Conditions During the Survey

Survey Location	Date & Time	Temperature (°C)	Wind Speed (m/s)	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
LT1	28/06/2023	21	0 - 1	SW	7	Trees rustling in the wind, distant sound of road traffic from the A50
LT2	28/06/2023	19	0 - 1	SW	7	Road traffic noise from the A50
LT3	28/06/2023	18	0 - 1	SW	7	Distant road traffic noise from the A50, humming from agricultural machinery
LT4	28/06/2023	21	0 - 1	SW	6	Road traffic noise from the A522 and Leigh Lane
LT1	05/07/2023	15	0 - 1	W	7	Trees rustling in the wind, distant sound of road traffic from the A50
LT2	05/07/2023	16	0 - 1	W	7	Road traffic noise from the A50
LT3	05/07/2023	16	0 - 1	W	7	Distant road traffic noise from the A50, humming from agricultural machinery
LT4	05/07/2023	15	0 - 1	W	7	Road traffic noise from the A522 and Leigh Lane

The results of the statistical and frequency measurements conducted during the baseline noise survey are summarised below in Table 4.3. All values are sound pressure levels in dB (re: 2×10^{-5} Pa).

Table 4.3: Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{Amax,T} (dB)	L _{Amin,T} (dB)	L _{A10,T} (dB)	L _{A90,T} (dB)
Weekday Daytime 07:00 - 23:00	80 hours	28/06/2023 – 05/07/2023	LT1	55.9	97.3	33.4	55.6	50.0
Weekday Night-time 23:00 – 07:00	40 hours	28/06/2023 – 05/07/2023		52.4	83.7	23.7	53.4	47.0
Weekend Daytime 07:00 - 23:00	32 hours	01/07/2023 – 02/07/2023		58.3	96.4	39.3	58.1	52.0
Weekend Night-time 23:00 – 07:00	16 hours	01/07/2023 – 02/07/2023		52.4	93.5	28.7	53.5	45.0
Weekday Daytime 07:00 - 23:00	79 hours	28/06/2023 – 05/07/2023	LT2	78.1	92.9	38.8	81.7	71.0
Weekday Night-time 23:00 – 07:00	40 hours	28/06/2023 – 05/07/2023		74.9	91.6	21.8	78.0	52.0
Weekend Daytime 07:00 - 23:00	32 hours	01/07/2023 – 02/07/2023		77.5	101.4	44.2	81.1	68.0
Weekend Night-time 23:00 – 07:00	16 hours	01/07/2023 – 02/07/2023		72.2	97.0	26.8	76.2	53.0
Weekday Daytime 07:00 - 23:00	80 hours	28/06/2023 – 05/07/2023	LT3	63.7	89.0	40.5	64.4	58.0
Weekday Night-time 23:00 – 07:00	40 hours	28/06/2023 – 05/07/2023		60.3	80.3	28.2	61.1	50.0

Period	Duration (T)	Monitoring Date and Times	Location	L _{Aeq,T} (dB)	L _{Amax,T} (dB)	L _{Amin,T} (dB)	L _{A10,T} (dB)	L _{A90,T} (dB)
Weekend Daytime 07:00 – 23:00	32 hours	01/07/2023 – 02/07/2023		65.5	96.7	46.2	65.6	60.0
Weekend Night-time 23:00 – 07:00	16 hours	01/07/2023 – 02/07/2023		58.1	82.7	30.3	60.3	56.0
Weekday Daytime 07:00 – 23:00	80 hours	28/06/2023 – 05/07/2023	LT4	57.7	94.7	38.8	57.3	54.0
Weekday Night-time 23:00 – 07:00	40 hours	28/06/2023 – 05/07/2023		54.4	83.5	38.1	53.6	46.0
Weekend Daytime 07:00 – 23:00	32 hours	01/07/2023 – 02/07/2023		58.2	90.6	43.1	58.2	52.0
Weekend Night-time 23:00 – 07:00	16 hours	01/07/2023 – 02/07/2023		55.0	87.7	39.5	55.3	48.0

All values are sound pressure levels in dB re: 2x 10⁻⁵ Pa.

4.2 REPRESENTATIVE BACKGROUND LEVELS

Using the data collected during the baseline survey, representative background noise levels have been derived for all receptor locations presented in Figure 4.4. The statistical analysis of the long-term data to determine representative background noise levels for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods are shown in Appendix D below. Table 4.4 presents the representative background noise levels considered appropriate for the existing sensitive receptors within the area.

Table 4.4: Representative Background Noise Levels (All Receptors)

Receptors	Monitoring Location	Time Period	Representative Background Noise Level (L _{A90,T} dB)*
R01, R10	LT3	Daytime (07:00 – 23:00)	58
		Night-time (23:00 – 07:00)	50
R02	LT2	Daytime (07:00 – 23:00)	64
		Night-time (23:00 – 07:00)	52
R03 – R06	LT1	Daytime (07:00 – 23:00)	50
		Night-time (23:00 – 07:00)	45
R07 – R09	LT4	Daytime (07:00 – 23:00)	52
		Night-time (23:00 – 07:00)	46

*Lowest L_{A90,T} value selected from either Weekday or Weekend.

The representative noise levels presented in Table 4.4 have been used to inform the assessment presented in Section 5.0.

5.0 ASSESSMENT OF EFFECTS

5.1 OPERATIONAL PHASE

5.1.1 BS 4142:2014 Noise Assessment

BS 4142:2014 states that corrections should be applied to account for certain acoustic features which have the potential to increase the level of effect at nearby properties.

The character of the sound from the development will generally be low level and constant, with no rapid change in the level or character of noise. Therefore, no impulsive penalty is applied.

It is considered that the plant items will not have identifiable on/off conditions, with many items operating at gradually varying loads. Therefore, no intermittency penalty is applied.

To determine whether a tonal penalty should be applied, the one-third octave objective method as described in Annex C of BS 4142:2014 has been utilised. The results of the analysis are presented in Appendix C. The results of the analysis show that the predicted noise at the nearest sensitive receptors does not contain any tones.

To provide a robust assessment and account for any uncertainty a +2 dB correction has been applied.

The assessment below compares the predicted cumulative Rating Level from the proposed development with the existing background sound level (L_{A90}) at the surrounding noise sensitive receptors. Table 5.1 presents the difference between the background noise level and predicted Rating Level from the proposed development.

It should be noted that the development is not expected to operate continuously, and similar developments tend to be called upon for short periods by National Grid, typically during the peak daytime periods and are rarely used during the night-time hours. To present a worst-case assessment, the proposed development is fully operational during the daytime and night-time periods.

Table 5.1: BS 4142:2014 Operational Noise Assessment

Location	Existing Measured Background L_{A90}		Rating level from plant ($L_{A,Tr}$)		BS 4142 Score	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
R01	58	50	29	30	-29	-20
R02	64	52	26	28	-38	-24
R03	50	45	19	20	-31	-25
R04	50	45	17	18	-33	-27
R05	50	45	18	19	-32	-26
R06	50	45	20	20	-30	-25
R07	52	46	19	21	-33	-25
R08	52	46	18	19	-34	-27
R09	52	46	14	15	-38	-31
R10	58	50	15	18	-43	-33

As presented in Table 5.1, worst-case Noise Rating levels are predicted to be below the existing background sound levels at all receptor locations during the daytime and night-time periods. Therefore, in accordance with NPPF, the development is considered to fall below the No Observed Adverse Effect Level (NOAEL).

5.1.2 Noise Intrusion Assessment

Internal noise levels, at nearby sensitive receptors from all sources of potential noise associated with the proposed development have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where an assumption of glazing with a sound reduction of 30 dB has been used. Table 5.2 and 5.3 present the daytime and night-time noise intrusions results respectively.

Table 5.2: Daytime Noise Intrusion Levels L_{Aeq} 1 hour

Location	External L_{Aeq} Noise Level at 1 metre from façade	Internal L_{Aeq} with windows-open	Internal L_{Aeq} with windows-closed	Criteria L_{Aeq}
R01	26.6	16.6	0.0	35
R02	24.4	14.4	0.0	35
R03	16.7	6.7	0.0	35
R04	15.0	5.0	0.0	35
R05	16.1	6.1	0.0	35
R06	18.0	8.0	0.0	35
R07	17.3	7.3	0.0	35
R08	16.1	6.1	0.0	35
R09	12.1	2.1	0.0	35
R10	13.4	3.4	0.0	35

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

Table 5.3: Night-time Noise Intrusion Levels L_{Aeq} 15mins

Location	External L_{Aeq} Noise Level at 1 metre from façade	Internal L_{Aeq} with windows-open	Internal L_{Aeq} with windows-closed	Criteria L_{Aeq}
R01	28.0	18.0	0.0	30
R02	25.9	15.9	0.0	30
R03	18.0	8.0	0.0	30
R04	16.4	6.4	0.0	30
R05	17.2	7.2	0.0	30
R06	17.8	7.8	0.0	30
R07	18.6	8.6	0.0	30
R08	17.2	7.2	0.0	30
R09	13.4	3.4	0.0	30
R10	15.5	5.5	0.0	30

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

The assessment shown in the tables above indicates that internal L_{Aeq} noise levels from all potential noise sources during the daytime and night-time periods are predicted to be below the WHO noise intrusion guidance at all sensitive receptors.

Internal noise levels at all receptors during the daytime and night-time periods fall within the NOAEL level in accordance with the NPPF.

For indicative purposes, the daytime and night-time noise contour plots (inclusive of all potential noise sources) are presented in Figure 5.1 and 5.2 respectively.

Figure 5.1: Daytime Noise Contour Plot (dB L_{Aeq,T}) at 1.5m AOD

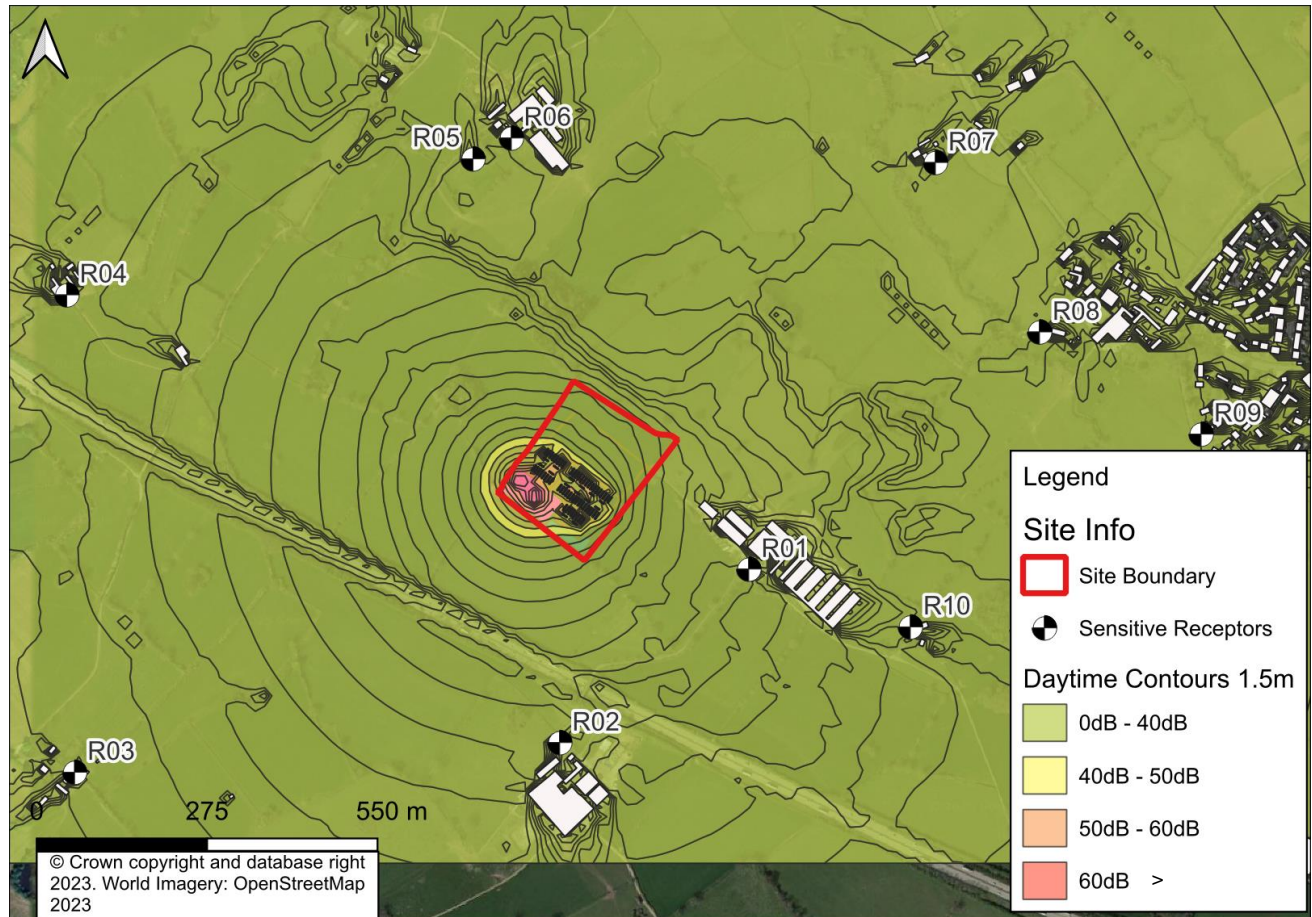
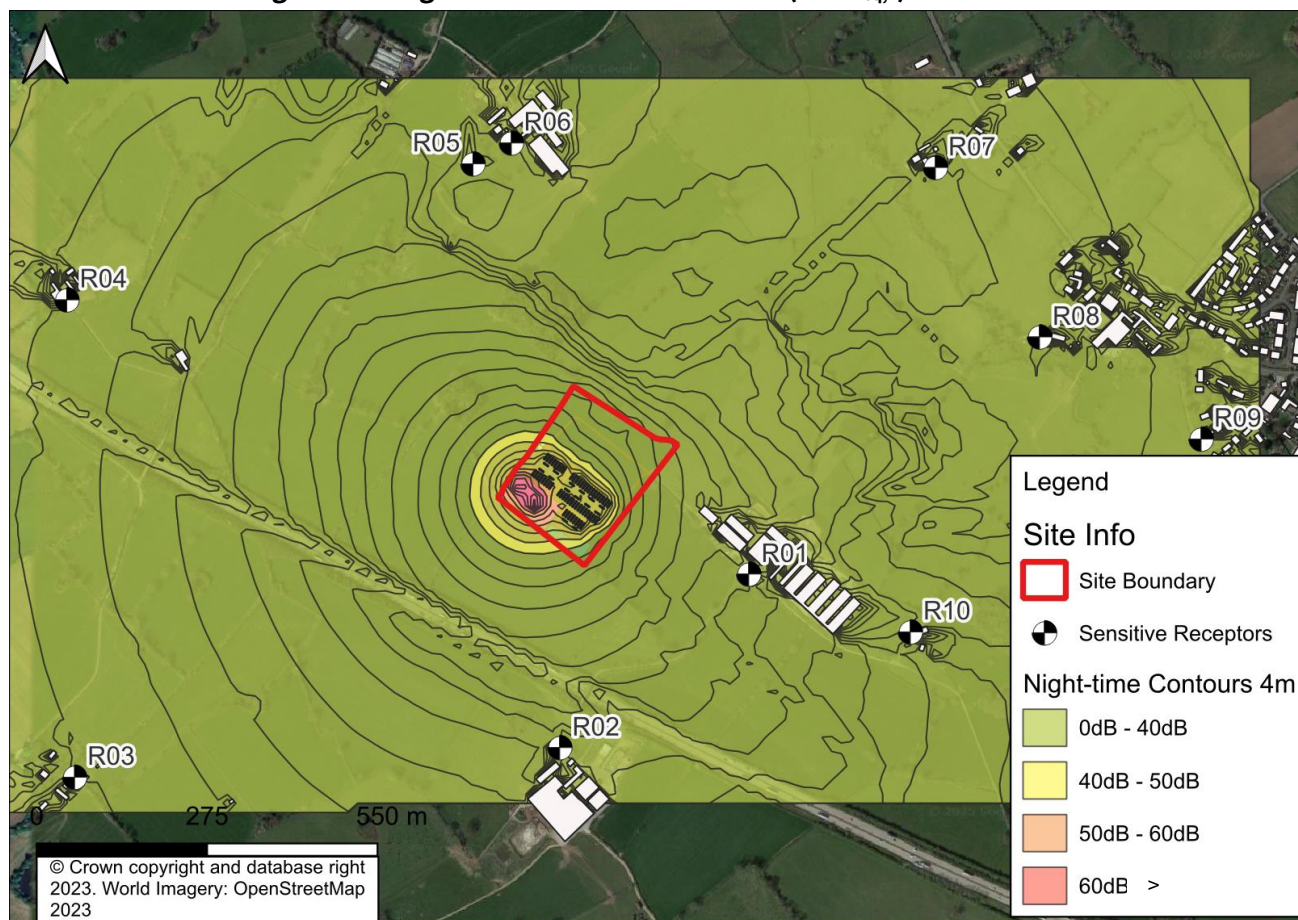


Figure 5.2: Night-time Noise Contour Plot (dB $L_{Aeq,T}$) at 4.0m AOD



5.1.3 Cumulative Noise Assessment – Change in Noise Levels

This assessment compares the noise from the existing ambient noise climate (based on existing measured L_{Aeq}), with the predicted noise level from the proposed scenario from all noise sources associated with the proposed development. The difference between the ‘existing’ ambient noise level and the predicted ‘worst-case proposed’ noise level is presented in Table 5.4 and Table 5.5 below.

Table 5.4: Difference between Baseline and Proposed Scenarios (Daytime)

Location	Measured Baseline $L_{Aeq,15mins}$	Measured Baseline Combined with Contribution from the Proposed Scenario	Contribution from Proposed Development $L_{Aeq,16\text{ hour}}$
R01	63.7	63.7	0.0
R02	77.5	77.5	0.0
R03	55.9	55.9	0.0
R04	55.9	55.9	0.0
R05	55.9	55.9	0.0
R06	55.9	55.9	0.0
R07	57.7	57.7	0.0

Location	Measured Baseline $L_{Aeq,15mins}$	Measured Baseline Combined with Contribution from the Proposed Scenario	Contribution from Proposed Development $L_{Aeq 16 hour}$
R08	57.7	57.7	0.0
R09	57.7	57.7	0.0
R10	63.7	63.7	0.0

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

Table 5.5: Difference between Baseline and Proposed Scenarios (Night-time)

Location	Measured Baseline $L_{Aeq,15mins}$	Measured Baseline Combined with Contribution from the Proposed Scenario	Contribution from Proposed Development $L_{Aeq 8 hour}$
R01	58.1	58.2	0.0
R02	72.2	72.2	0.0
R03	52.4	52.4	0.0
R04	52.4	52.4	0.0
R05	52.4	52.4	0.0
R06	52.4	52.4	0.0
R07	54.4	54.4	0.0
R08	54.4	54.4	0.0
R09	54.4	54.4	0.0
R10	58.1	58.1	0.0

All values are sound pressure levels in dB re: 2×10^{-5} Pa.

As demonstrated in Table 5.4 and Table 5.5, the noise contribution from the proposed development would result in no increase of ambient noise levels during the daytime and night-time periods. This is indicative of a negligible short-term impact as defined by the IEMA 2014 Guidelines for Environmental Noise Impact Assessment. As such, noise levels from the proposed operation of the development at the surrounding existing sensitive receptors are predicted to result within the No Observed Adverse Effect Level (NOAEL) for the daytime and night-time periods.

5.1.4 Summary of Assessments

The results of the assessments presented above are summarised below.

- BS 4142:2014 Operational assessment – Daytime and night-time noise rating levels are predicted to be below the existing background noise levels, which is an indication of a low impact and an indication that the proposed development falls within the NOAEL.
- Noise Intrusion assessment in accordance with BS 8233:2014/WHO – Noise levels are predicted to fall below the internal guideline criteria at all receptors for the daytime and night-time periods with windows open. Therefore, the noise intrusion assessment indicates that the proposed development falls within the NOAEL.

- Change In Noise Level assessment - the change in noise level assessment presented above, in accordance with guidelines presented in IEMA, indicates that changes in noise levels as a result of the proposed development are predicted to fall within the NOAEL.
- Overall, the impact from the proposed development falls within the NOAEL band and therefore no additional mitigation is required.

6.0 CONCLUSIONS

This report presents the findings of a noise assessment to support a planning application for a battery energy storage system (BESS) development at Tea Leys Farm, Tea Leys, Staffordshire.

The assessment considers the potential noise generation from the plant associated with the proposed development, with respect to existing noise levels in the area.

Daytime and Night-time noise levels have been assessed using the assessment methodology contained in British Standard 4142:2014+A1:2019 *Method for rating and assessing industrial and commercial sound* and BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings – Code of practice'*.

The assessment identifies that the rating levels from the proposed operations are predicted to be below the existing daytime and night-time background noise levels at the closest sensitive receptors. This is an indication of a low impact and falls within the No Observed Adverse Effect Level (NOAEL).

Operational noise levels during the daytime and night-time periods are below the WHO guideline for noise intrusion at all receptors during the daytime and night-time periods period and therefore fall within the No Observed Adverse Effect Level (NOAEL).

A change in noise level assessment has been undertaken which shows that noise levels are not expected to change significantly and therefore fall within the NOAEL.

It should be noted that the assessment considers that all items of plant associated with the BESS are assumed to be always fully operational during the daytime and night-time periods. The development will not operate continuously, and similar developments tend to operate for short periods by National Grid, typically during the peak daytime periods and are rarely used during the night-time hours.

When assessed on a worst-case basis, noise from the proposed development is predicted to have a negligible impact and noise levels fall within the NOAEL.

Therefore, the proposed development is not expected to have an adverse impact on health or quality of life.

APPENDICES

APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

Acoustic Terminology

- dB** Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.
- dB(A)** Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dBA value provides a good representation of how loud a sound is.
- L_{Aeq}** Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq, 07:00 - 23:00}$ for example, describes the equivalent continuous noise level over the 16-hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower than the $L_{Aeq, 07:00 - 23:00}$.
- L_{Amin}** The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.
- L_{Amax}** The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
- L_n** Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say, 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10, 1 \text{ hr}} = x \text{ dB}$.
- The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90} , the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
- R_w** The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

Abbreviations

CADNA – Computer Aided Noise Abatement
DMRB – Design Manual for Roads and Bridges
HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance
UDP – Unitary Development Plan
UKAS – United Kingdom Accreditation Service

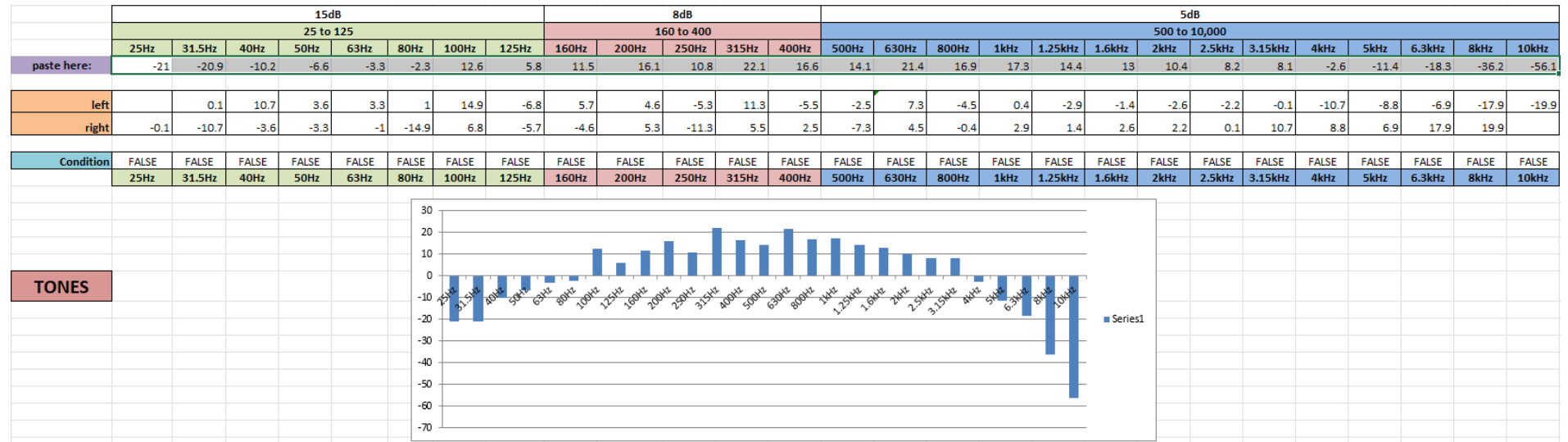
APPENDIX B – NOISE MODELLING DATA

Table B1: Plant Noise Data

Plant	Broadb and L _{WA} dB	Third Octave Band (Hz) Sound Power Level (L _w) dB re: 1x10 ⁻¹² W																										
		25 Hz	31. 5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1.0 kHz	1.25 kHz	1.6 kHz	2.0 kHz	2.5 kHz	3.15 kHz	4.0 kHz	5.0 kHz	6.3 kHz	8.0 kHz	10.0 kHz
Solar Array Conversion Unit (Ingecon Sun FSK C series)	72.1	62.1	62.1	62.1	62.1	64.9	56.3	65	68.4	60.9	59.1	64.7	64.6	62	63.4	63.4	61.4	61	61.7	61.3	58.1	59.1	64	52.1	50.3	54.1	45.6	43.8
Substation Transformer	88.3	84.5	76.5	85.5	84.5	83.5	81.5	93.5	77.5	72.5	88.5	77.5	90.5	80.5	74.5	84.5	76.5	77.5	65.5	59.5	56.5	55.5	54.5	55.5	54.5	53.5	50.5	50.5
Battery Storage Unit (MC Cube ESS)	68.9	55.1	54.4	55.3	56	52.8	51.6	56.4	64.1	69.9	63.5	63.2	63.7	64.1	60.6	61	59.7	57.9	58.5	56.9	55.8	53.9	51.9	49.7	45.6	44.1	41.6	38.3

APPENDIX C – ONE-THIRD OCTAVE BAND OBJECTIVE ANALYSIS

Figure C.1: One-Third Octave Band Data Analysis at Receptor R01



APPENDIX D – EXISTING BACKGROUND NOISE LEVELS – STATISTICAL ANALYSIS

Figure D1: Existing Daytime Background Noise Level – Statistical Analysis LT1 (Week Day)

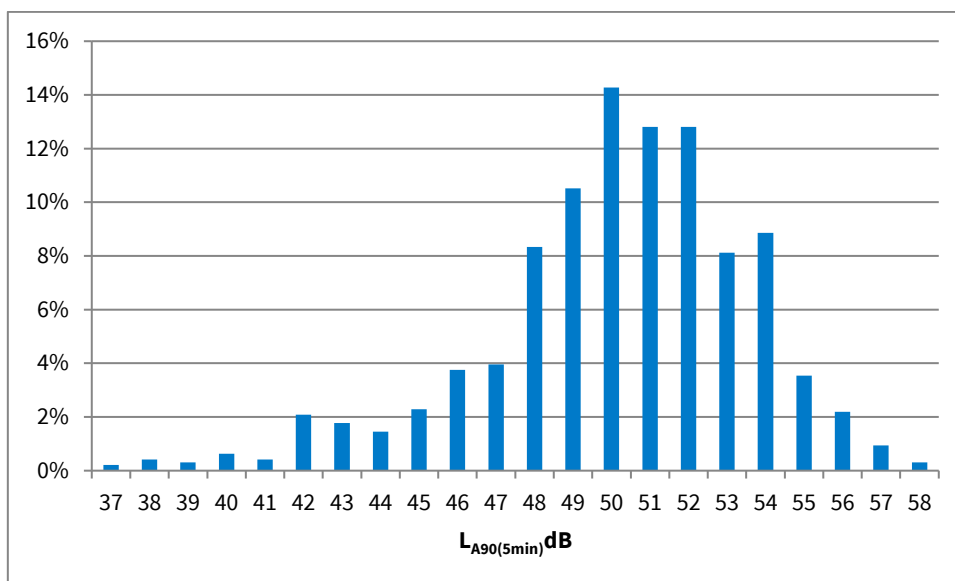


Figure D2: Existing Night-time Background Noise Level – Statistical Analysis LT1 (Week Day)

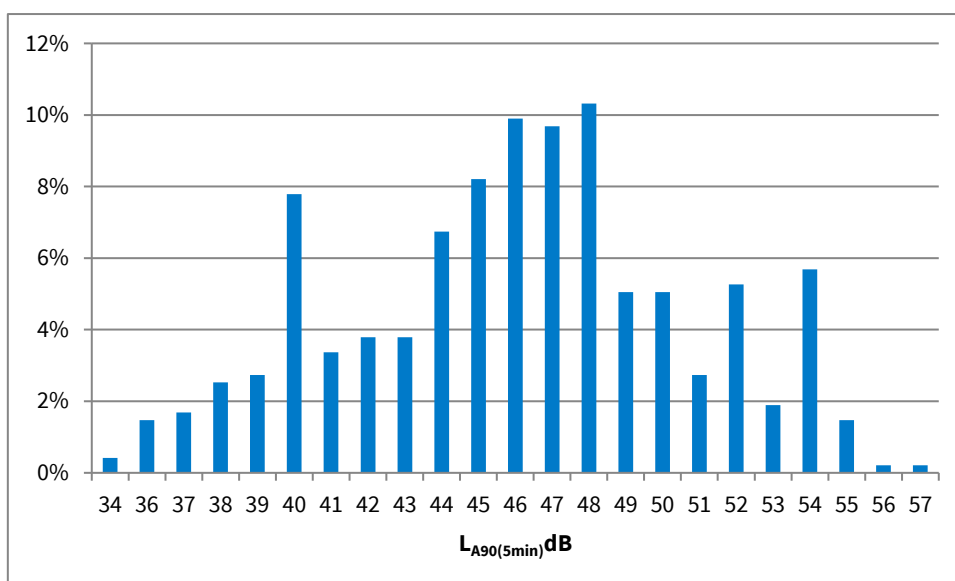


Figure D3: Existing Daytime Background Noise Level – Statistical Analysis LT1 (Weekend)

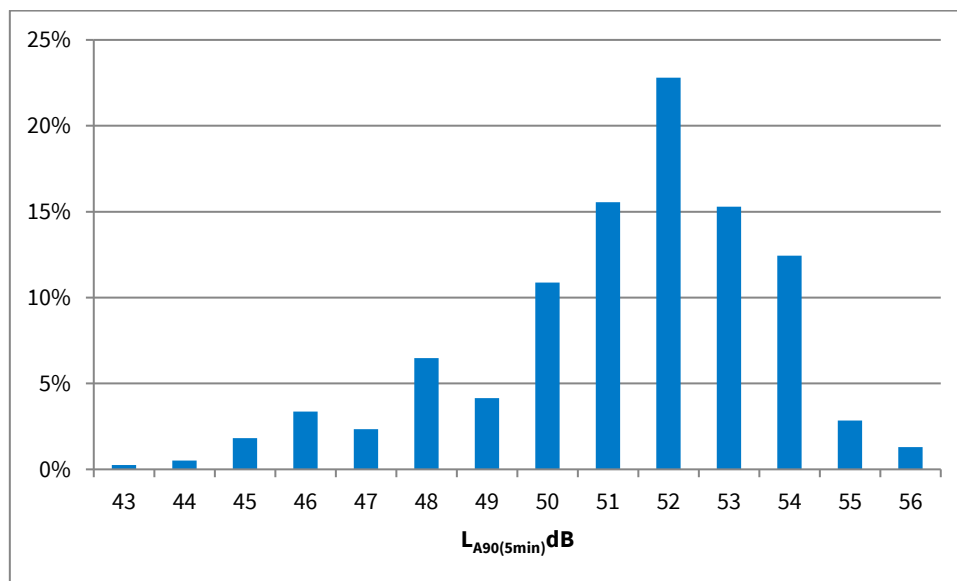


Figure D4: Existing Night-time Background Noise Level – Statistical Analysis LT1 (Weekend)

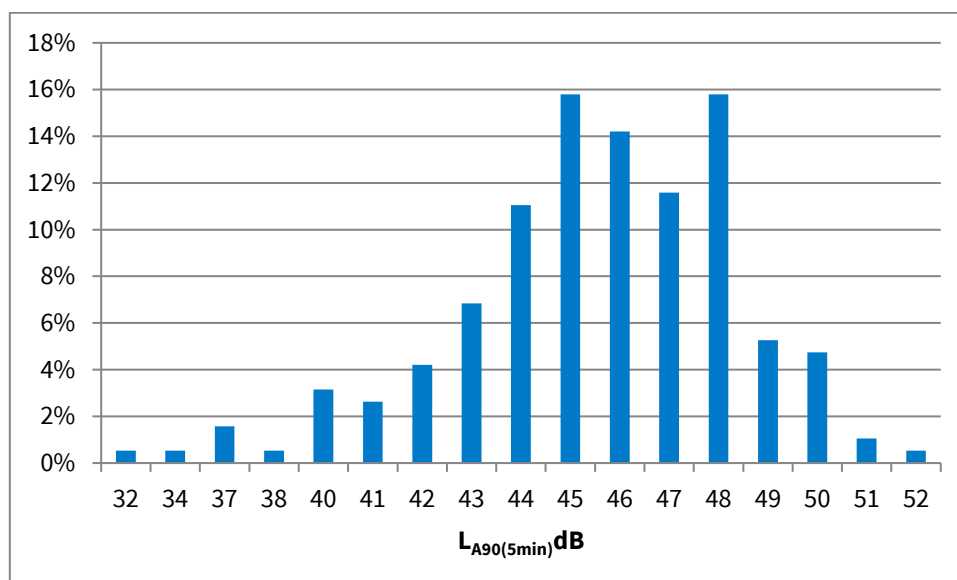


Figure D5: Existing Daytime Background Noise Level – Statistical Analysis LT2 (Week Day)

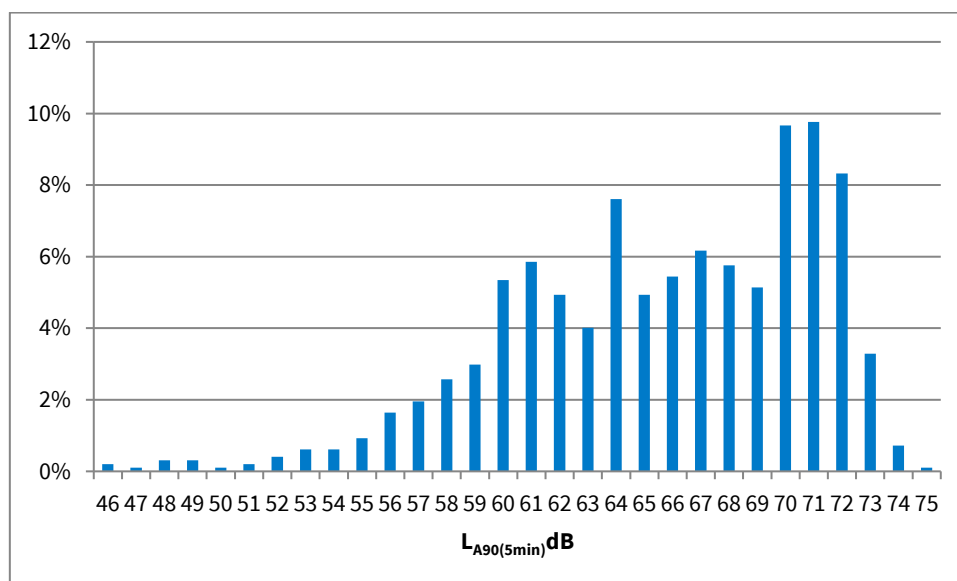


Figure D6: Existing Night-time Background Noise Level – Statistical Analysis LT2 (Week Day)

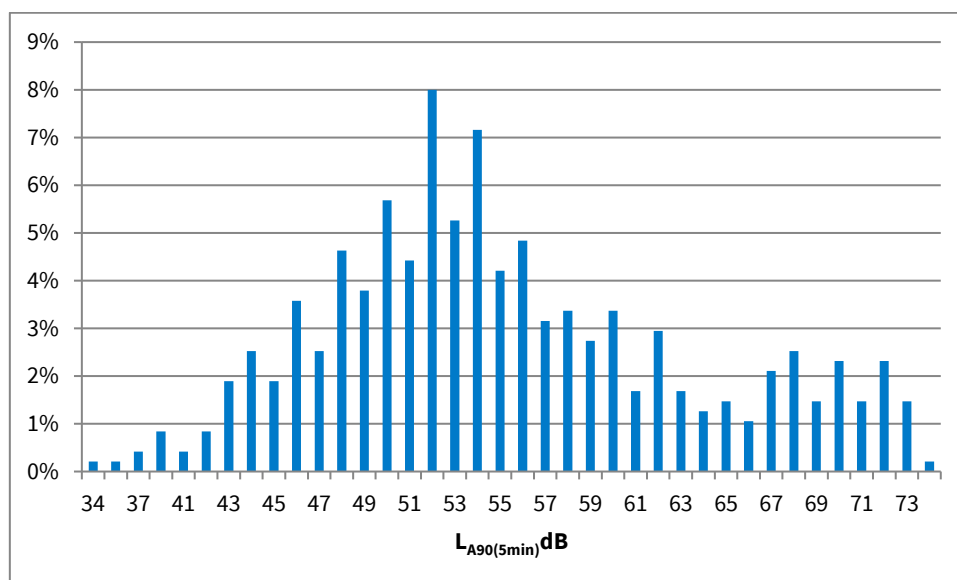


Figure D7: Existing Daytime Background Noise Level – Statistical Analysis LT2 (Weekend)

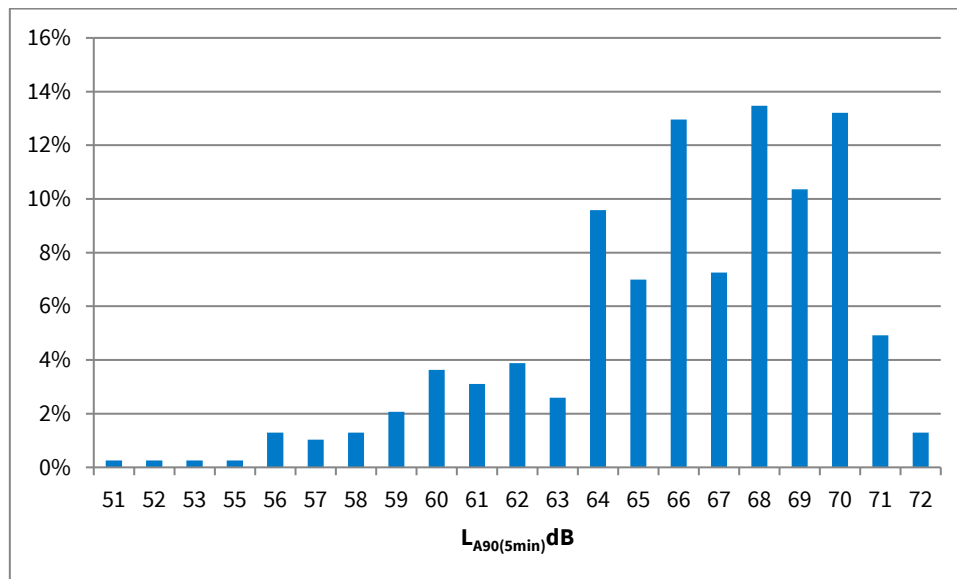


Figure D8: Existing Night-time Background Noise Level – Statistical Analysis LT2 (Weekend)

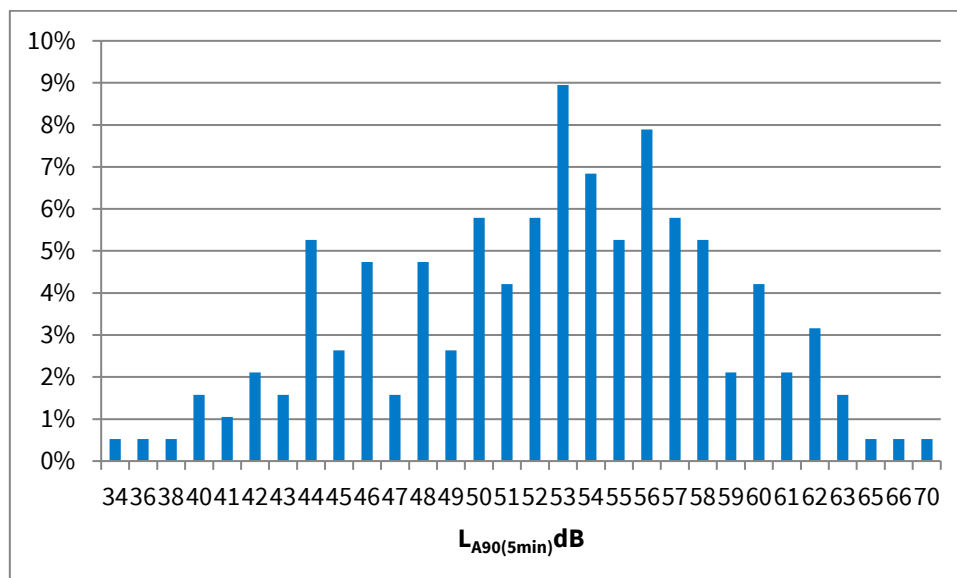


Figure D9: Existing Daytime Background Noise Level – Statistical Analysis LT3 (Week Day)

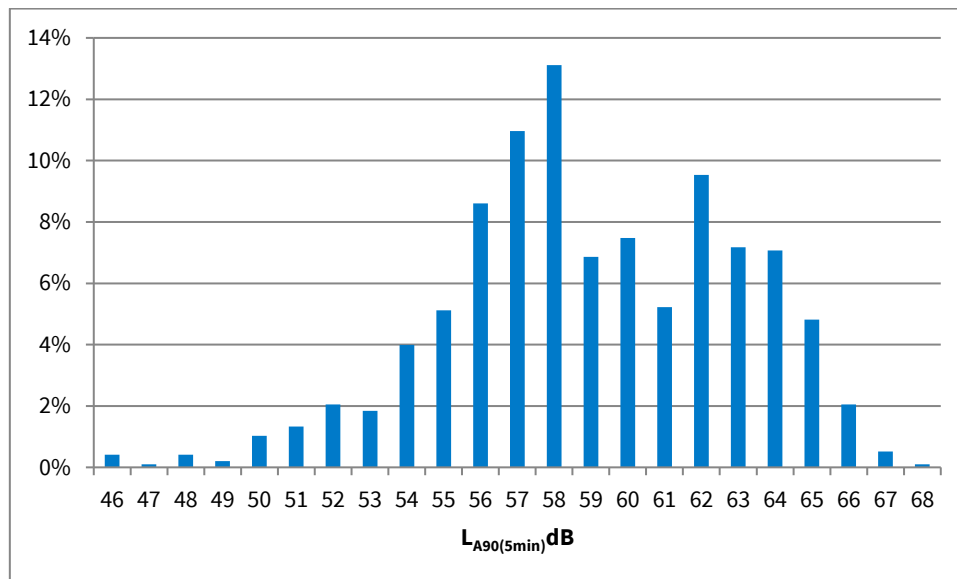


Figure D10: Existing Night-time Background Noise Level – Statistical Analysis LT3 (Week Day)

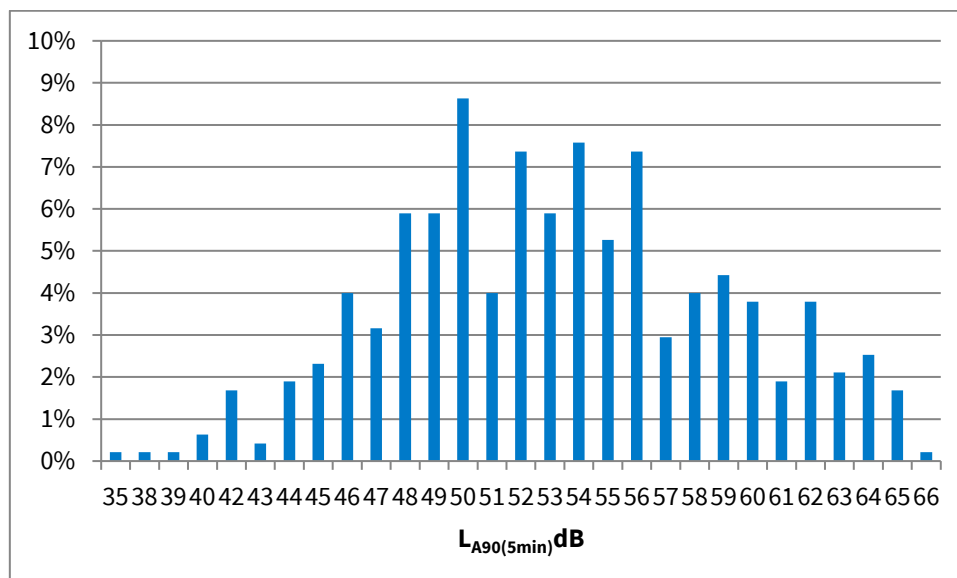


Figure D11: Existing Daytime Background Noise Level – Statistical Analysis LT3 (Weekend)

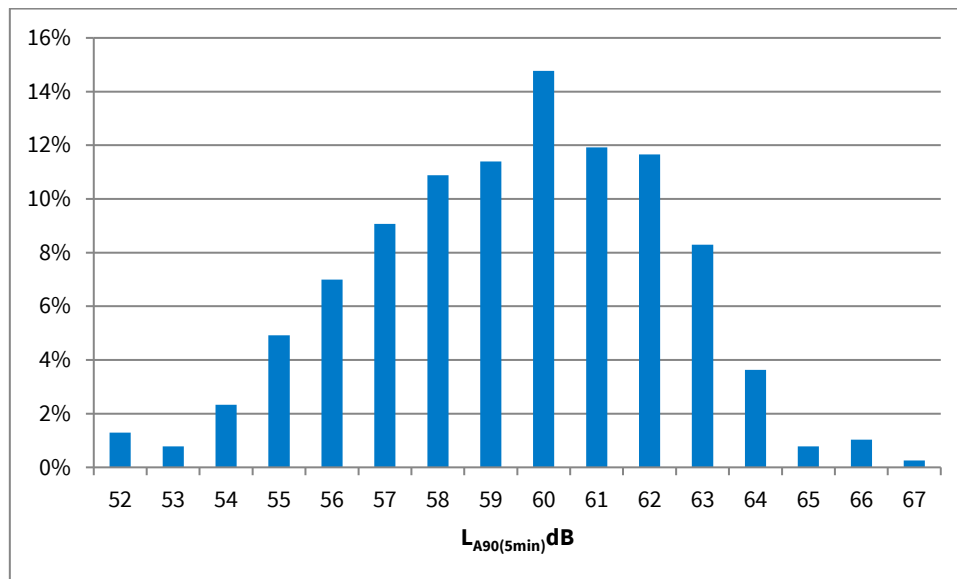


Figure D12: Existing Night-time Background Noise Level – Statistical Analysis LT3 (Weekend)

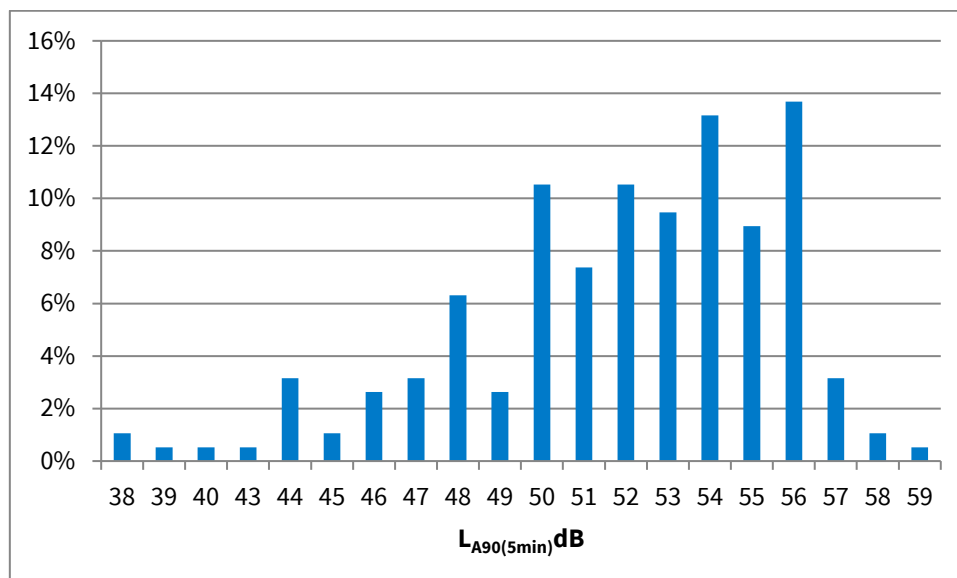


Figure D13: Existing Daytime Background Noise Level – Statistical Analysis LT4 (Week Day)

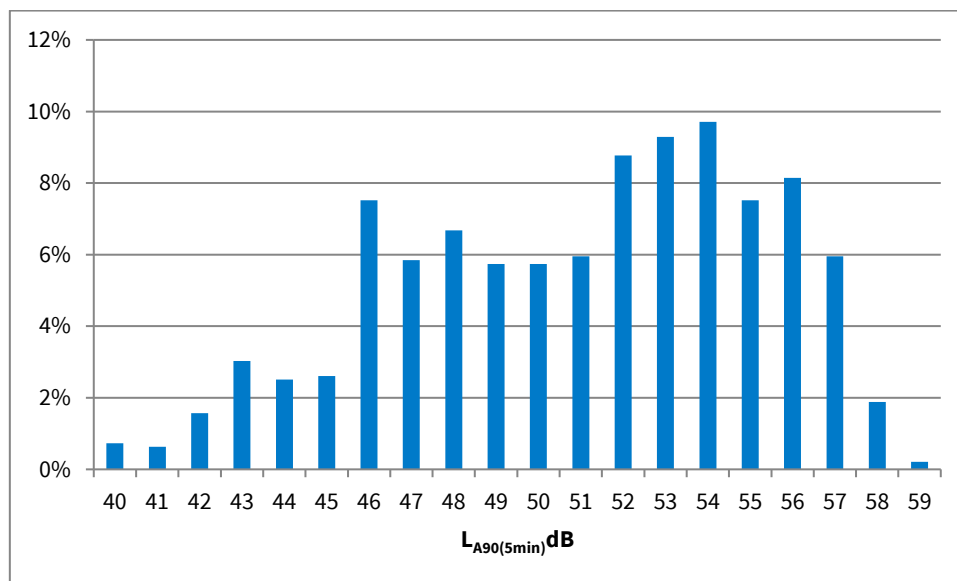


Figure D14: Existing Night-time Background Noise Level – Statistical Analysis LT4 (Week Day)

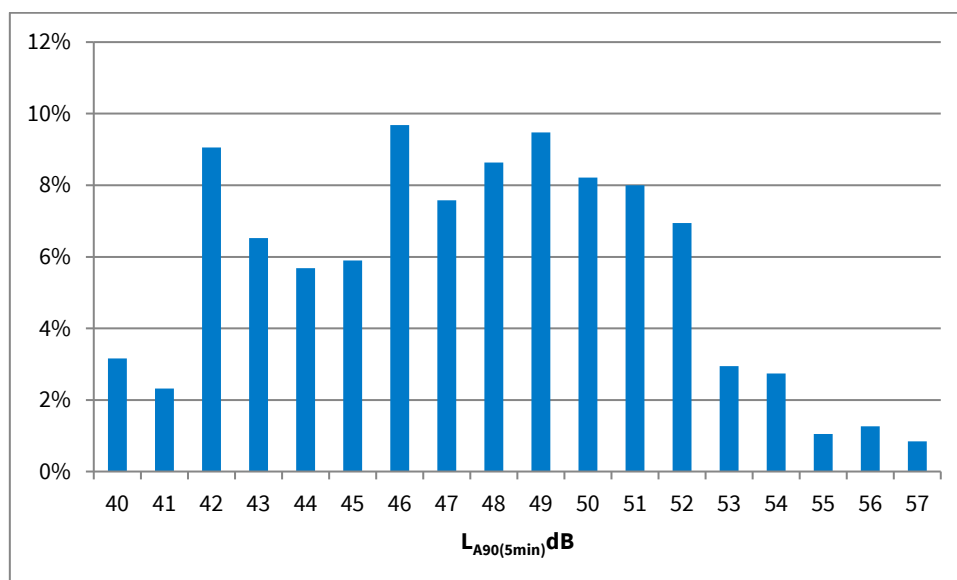


Figure D15: Existing Daytime Background Noise Level – Statistical Analysis LT4 (Weekend)

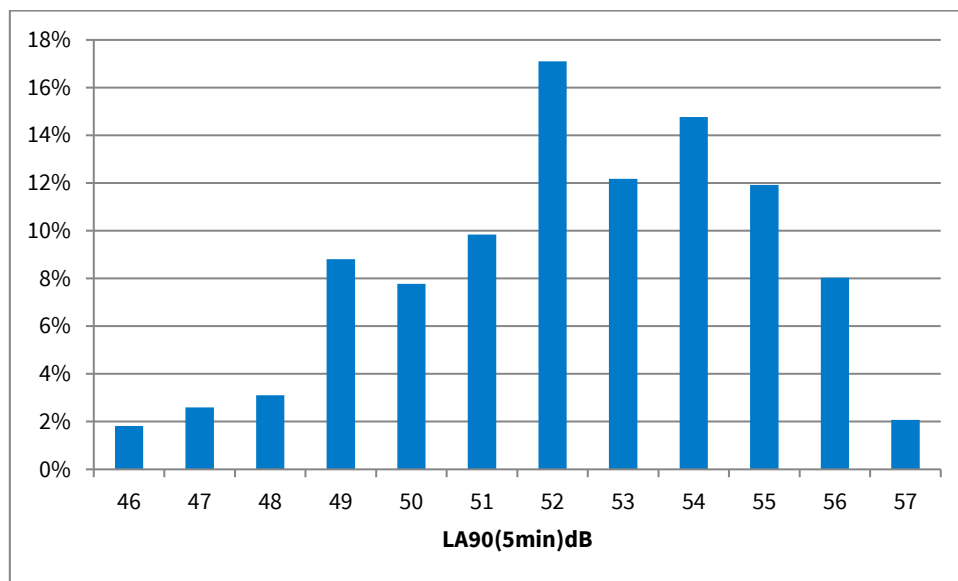
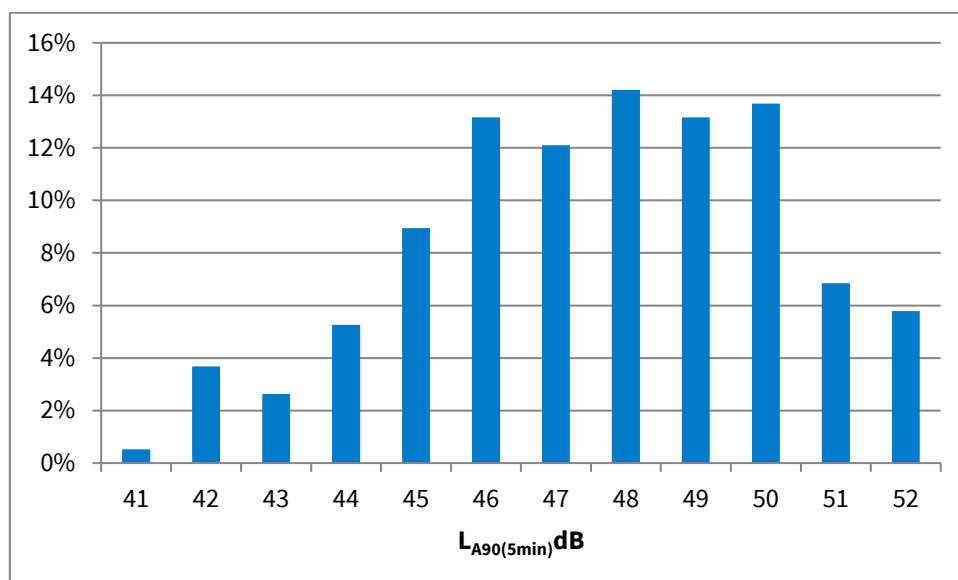


Figure D16: Existing Night-time Background Noise Level – Statistical Analysis LT4 (Weekend)



APPENDIX E – REPORT CONDITIONS

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