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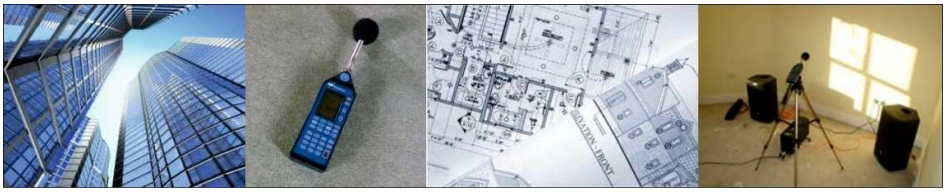

# BATTERY STORAGE FACILITY
# BRANXTON BESS
# INNERWICK
# EAST LOTHIAN
# EH42 1SE

ACOUSTIC DESIGN SPECIFICATION
v.8

Client:
**BRAXBESS LTD**
2 Upperton Gardens
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England
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19th January 2024
Ref: M5368

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| Issue No. | 8 |
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| Date | 19th January 2024 |

## 1. SUMMARY

1.1 An assessment of noise has been undertaken at Branxton Bess, Innerwick, East Lothian, EH42 1SE to consider the potential impact of the Battery Storage Facility. The facility will offer additional power to the national grid during peak periods of demand, which is generally during day or evening periods only.

1.2 Ambient noise levels have been measured at a representative location close to residential properties, and this exercise indicates that the background noise level, $L_{A90,5mins}$, would typically fall to levels of 30 dB(A) during the daytime period of (07.00 – 23.00 hrs), and 24 dB(A) during the night-time period (23.00 – 07.00 hrs).

1.3 The Environmental Health Officer for East Lothian Council has suggested the following guidelines.

- *I would suggest for external amenity BS4142 assessment would be appropriate with The Rating Level, LArTr, of noise associated with the operation of the proposed facility when measured 3.5m from the façade of any neighbouring residential property, shall be no more than 5dB (A) above the background noise level, LA90,T. All measurements to be made in accordance with BS 4142: 2014 "Methods for Rating and Assessing Industrial and Commercial Sound."*

- *I would also suggest for internal amenity Noise arising from any proposed plant or equipment associated with the development shall not exceed Noise Rating Curve NR 20 at any Octave Band Frequency when measured within any neighbouring residential property assuming windows open at least 50mm. This is due to the likelihood of the facility operating during the night.*

1.4 Calculations of noise radiating from the attenuated equipment have predicted noise levels of 24 dB(A) during the daytime and 26 dB(A) at night-time at 1m from the facade of the nearest residential properties some 970m away.

1.5 Rating Levels of 28dB(A) have been confirmed and these will meet the requirements set out by East Lothian Council.

1.6 Predicted internal noise levels have been established and it is confirmed that these will be below the NR20 Rating Curve and therefore will meet the requirements set out by East Lothian Council.

1.7 A further assessment of the predicted noise, in absolute terms, indicates that levels would be significantly below the British Standard 8233 guidelines for residential occupation during both the day and night.

1.7 Consideration of noise affecting adjacent commercial buildings indicates that residual levels from the Battery Storage Facility would be comfortably below BS8233 guideline values.

1.8 It is therefore concluded that the proposed installation of the Battery Storage Facility, with attenuated noise sources, would not have a significant adverse impact on the neighbouring properties.

## 2. INTRODUCTION

2.1 An assessment has been undertaken by Ian Sharland Limited on behalf of Energy Hub Developments, to assess the impact of noise emanating from a proposed battery storage facility on neighbouring properties.

2.2 The proposed location of the facility is situated on farm land south of Barns Ness Terrace and south from Innerwick Farm. Figure 1 indicates the location of the site, and the proposed compound within. The aerial photograph also indicates the nearest noise sensitive receptors (NSRs).

2.3 The facility will comprise the following noise sources (as shown in Figure 2):

- 300 sets of 10no Battery Storage Containers,
- 150 Inverters,
- 75 Step up / down Transformers,
- 6 Substation Transformers.

2.4 Given the locality of residential properties to the site it is necessary to assess if emitted noise will have any adverse impact. Consideration should also be given to any adjacent commercial neighbours.

2.5 The objectives of the present exercise may therefore be summarised as follows:

(a) To determine the existing ambient noise levels in the area,
(b) To determine the likely noise emitted from the new facility,
(c) Where appropriate, to recommend forms of noise control that will limit emissions to an acceptable level,
(d) To assess the emitted noise in accordance with relevant standards.

2.6 This report describes the work conducted on each of those objectives and summarises the conclusions that can be drawn from the results.

## 3. SURVEY OF AMBIENT NOISE LEVELS

3.1 To assess the ambient background noise levels, a noise survey was undertaken at representative locations of the nearest residential properties.

3.2 Three Rion NL-52 sound level meters were set up with the microphones attached to extendable light stands to a height of 1.5m above ground in free field conditions at the following locations, see Figure 3 – Monitoring Locations).

- P1 - Approximately 620m southeast of the proposed site,
- P2 – Approximately 440m of the proposed site,
- P3 – In the garden of Innerwick farmhouse.

3.3 The equipment was calibrated before and after the measurements were taken and showed no significant variation.

3.4 The survey ran from the afternoon of Friday 10th to the morning of Monday 13th February 2023.

3.5 The weather conditions[1] during the survey were as follows:

| Date | Ave Temp °C | Rainfall mm | Ave Wind Speed m/s | Prevailing Wind Direction |
|---|---|---|---|---|
| Friday 10/02 | 10.0 | 0.0 | 8.0 – 10.7 | SW |
| Saturday 11/02 | 9.0 | 0.4 | 3.4 – 5.4 | SW |
| Sunday 12/02 | 9.0 | 0.0 | 3.4 – 5.4 | SW |
| Monday 13/02 | 7.0 | 0.0 | 1.6 – 3.3 | W |

**Table 3.1 – Weather Conditions During Survey**

3.6 The meter was configured to measure 5-minute samples of the following acoustic parameters:

$L_{Aeq}$ The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

$L_{Amax}$ The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

$L_{A90}$ A statistical parameter, representing the A-weighted noise level exceeded for 90% of each sample period. This gives a measure of the underlying noise and is commonly used to describe the ambient background noise.

[1] Weather information from weatheronline.co.uk

3.7 The variation of measured noise levels is shown graphically in Figures 4, 5 & 6.

3.8 Table 3.2 provides a statistical analysis of the measured background noise levels across each day of the survey, offering values for the mean, modal, median and 90th percentile. For reference, measurements for Friday 10th daytime and night-time will be disregarded due to the adverse weather conditions.

| LOCATION P1 | | | | | |
|---|---|---|---|---|---|
| **Day** | **Period** | **Mean** | **Modal** | **Median** | **90th Percentile** |
| Friday 10/02 | Day* | 43 | 42 | 43 | 41 |
| | Night | 42 | 46 | 44 | 36 |
| Saturday 11/02 | Day | 35 | 32 | 34 | 31 |
| | Night | 28 | 27 | 28 | 25 |
| Sunday 12/02 | Day | 26 | 20 | 25 | 20 |
| | Night | 28 | 24 | 27 | 23 |
| Monday 13/02 | Day* | 40 | 40 | 40 | 38 |
| | Night | n/a | n/a | n/a | n/a |
| **Survey Period** | **Day** | **34** | **32** | **33** | **21** |
| | **Night** | **33** | **26** | **30** | **24** |

| LOCATION P2 | | | | | |
|---|---|---|---|---|---|
| **Day** | **Period** | **Mean** | **Modal** | **Median** | **90th Percentile** |
| Friday 10/02 | Day* | 49 | 48 | 49 | 46 |
| | Night | 47 | 51 | 48 | 40 |
| Saturday 11/02 | Day | 38 | 36 | 36 | 32 |
| | Night | 29 | 27 | 28 | 27 |
| Sunday 12/02 | Day | 27 | 30 | 28 | 22 |
| | Night | 28 | 23 | 26 | 23 |
| Monday 13/02 | Day* | 41 | 41 | 41 | 39 |
| | Night | n/a | n/a | n/a | n/a |
| **Survey Period** | **Day** | **36** | **30** | **35** | **24** |
| | **Night** | **35** | **27** | **31** | **24** |

| LOCATION P3 | | | | | |
|---|---|---|---|---|---|
| **Day** | **Period** | **Mean** | **Modal** | **Median** | **90th Percentile** |
| Friday 10/02 | Day* | 49 | 49 | 49 | 47 |
| | Night | 48 | 53 | 50 | 37 |
| Saturday 11/02 | Day | 41 | 34 | 41 | 34 |
| | Night | 30 | 29 | 29 | 27 |
| Sunday 12/02 | Day | 32 | 35 | 34 | 22 |
| | Night | 30 | 21 | 30 | 22 |
| Monday 13/02 | Day* | 45 | 49 | 45 | 42 |
| | Night | n/a | n/a | n/a | n/a |
| **Survey Period** | **Day** | **39** | **34** | **39** | **25** |
| | **Night** | **36** | **27** | **32** | **35** |

**Part measurements*

**Table 3.2 – Summary of Background Noise Levels**

3.9 With due consideration for the aim of obtaining the representative background noise, this project will adopt the following background noise levels,

**Daytime 07.00 – 23.00** **30 dB(A) $L_{A90}$**

**Night-time 23.00 – 07.00** **24 dB(A) $L_{A90}$**

## 4. PREDICTION OF FACILITY NOISE

4.1 The proposal for the Battery Storage Facility involves the installation of the four main noise sources – Inverters, chillers with the battery containers, step up/down transformers and substation transformers.

4.2 It has been confirmed by the client (through the manufacturer's data) that the equipment will each generate the following sound power levels:

- 300 sets of 10no Battery Containers including chillers – each rated at 88 dB(A) $L_{wA}$
- 150 Inverters – each rated at 76 dB(A) $L_{wA}$
- 75 Step up/down Transformers – each rated at 67 dB(A) $L_{wA}$
- 6 Substation Transformers & STP Transformer – rated at 69 dB(A) $L_{wA}$.

4.3 The frequency levels of sound power associated with each item are as follows:

| Frequency | Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---|---|---|---|---|---|---|---|---|---|
| Battery Containers | dB | 94 | 88 | 87 | 85 | 83 | 79 | 74 | 73 |
| Inverters | dB | 84 | 75 | 75 | 73 | 71 | 67 | 64 | 62 |
| Step up/down Transformers | dB | 81 | 73 | 67 | 63 | 61 | 57 | 53 | 38 |
| Substation Transformers | dB | 81 | 72 | 68 | 65 | 64 | 61 | 57 | 50 |

**Table 4.1 – Source Sound Power Levels**

4.4 The equipment will require the following levels of attenuation, the detailed engineering of which is to be determined:

- Battery Containers: -21 dB,
- Inverters: -2 dB,
- Transformers: 0 dB,
- Substations: 0 dB.

4.5 The distances from a noise source to the nearest residential noise sensitive receptors (NSR) are shown in Table 4.2.

| Receptor | Distance from Compound (m) |
|---|---|
| R1: Innerwick Farm | 315 (north) |
| R2: Houses along Barns Ness Terrace | 375 (north) |
| R3: Castledene | 790 (east) |
| R4: Thurston Mains Cottage | 970 (west) |
| R5: Primrose Cottage | 1020 (northwest) |
| R6: Black Castle Cottage | 1350 (southeast) |

**Table 4.2 – Distances of NSRs (residential) to the centre of the compound.**

4.6 It should be noted that there are likely to be non-residential buildings adjacent to the proposed site and these will have office areas, although these will be no closer to the proposed site than residential properties.

4.7 INoise V2020 noise mapping software has then been used to provide predictions of noise emanating from the compound to the facade of both residential and commercial buildings. The software follows the methodology of BS EN ISO 9613: 2007 Acoustics - 'Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels'. Figures 7 & 8 provides an extract from the model for the attenuated noise at 1.5m (ground floor) & 4.5m (1st floor) above ground respectively.

4.8 The results of the predictions are as follows:

| **Receptor** | **Predicted Facade Noise Level (Attenuated) $L_{Aeq,T}$ dB** | |
|---|---|---|
| | **Ground Floor** | **Upper Floor** |
| **Residential** | | |
| R1: Innerwick Farm | 21 | 23 |
| R2: Houses along Barns Ness Terrace | 21 | 22 |
| R3: Castledene | 18 | 21 |
| R4: Thurston Mains Cottage | 24 | 26 |
| R5: Primrose Cottage | 23 | 24 |
| R6: Black Castle Cottage | 15 | 17 |

**Table 4.3 – Predicted Attenuated Noise Levels**

4.19 The octave band spectrum for the most onerous predicted noise level is shown in Table 4.4. This includes the distance correction to the façade, the façade correction and the loss of 13dB through an open window.

| **63** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** |
|---|---|---|---|---|---|---|---|
| 46 | 30 | 27 | 24 | 21 | 14 | -1 | -43 |

**Table 4.4 – Predicted Internal Octave Band Frequency Spectrum**

# 5. PLANNING POLICY & CRITERIA OF ACCEPTABILITY

## 5.1 National Planning Framework 4 (February 2023)

5.1.1 Strategy and policies support development that helps to improve health and wellbeing. The spatial strategy as a whole recognises that there are significant health inequalities in Scotland that future development can help to address. The spatial principles aim to ensure that future development is directed to sustainable locations, recognising that the role of planning in supporting development in places which would benefit most from regeneration and investment.

5.1.2 Policy 23 helps to protect health and wellbeing, including by ensuring that air and noise pollution are taken into account, and by planning and managing development to take hazards into account.

5.1.3 Policy 23

a) Development proposals that will have positive effects on health will be supported. This could include, for example, proposals that incorporate opportunities for exercise, community food growing or allotments.

b) Development proposals which are likely to have a significant adverse effect on health will not be supported. A Health Impact Assessment may be required.

c) Development proposals for health and social care facilities and infrastructure will be supported.

d) Development proposals that are likely to have significant adverse effects on air quality will not be supported. Development proposals will consider opportunities to improve air quality and reduce exposure to poor air quality. An air quality assessment may be required where the nature of the proposal or the air quality in the location suggest significant effects are likely.

e) Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely.

f) Development proposals will be designed to take into account suicide risk.

g) Development proposals within the vicinity of a major accident hazard site or major accident hazard pipeline (because of the presence of toxic, highly reactive, explosive or inflammable substances) will consider the associated risks and potential impacts of the proposal and the major accident hazard site/pipeline of being located in proximity to one another.

h) Applications for hazardous substances consent will consider the likely potential impacts on surrounding populations and the environment.

i) Any advice from Health and Safety Executive, the Office of Nuclear Regulation or the Scottish Environment Protection Agency that planning permission or hazardous substances consent should be refused, or conditions to be attached to a grant of consent, should not be overridden by the decision maker without the most careful consideration.

j) Similar considerations apply in respect of development proposals either for or near licensed explosive sites (including military explosive storage sites).

## 5.2 Planning Advice Note 1/2013: Environmental Impact Assessment

5.2.1 Environmental Impact Assessment ( EIA) is a process which identifies the environmental effects (both negative and positive) of development proposals. It aims to avoid, reduce, and offset any adverse impacts.

5.2.2 PAN explains the role of individual planning authorities and that of the Consultation Bodies in EIA, as well as providing guidance on the ways in which EIA can be integrated into the overall development management process. It is also intended as a point of reference for developers and their consultants - who prepare the EIA Report on behalf of their client - on the role they too have to play in working toward the Scottish Government's aim of more efficient and effective EIA. PAN does not however provide any detailed technical guidance on how to undertake an environmental assessment, other than to set out what planning authorities and the Consultation Bodies will expect to see in an EIA Report which is both proportionate and 'fit for purpose'.

5.2.3 PAN concerns EIAs undertaken within the Planning EIA regime, as required by The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 [1] ('the EIA Regulations').

5.2.4 EIA aims to ensure that the likely environmental effects of a development proposal are properly understood before any development consent is granted. EIA therefore provides a means of assessing the likely significant environmental effects of a proposal, and the potential for avoiding, reducing or offsetting any adverse impacts, in a manner which is both systematic and transparent.

5.2.5 For the majority of applications the usual planning process provides a means of assessing the environmental effects of a proposal, and the absence of a formal EIA does not mean that environmental issues are not being considered. Planning authorities have at their disposal wide ranging duties and powers to collect and evaluate information from consultees and the applicant before determining any planning application. However, in cases where a proposal is likely to have a significant environmental effect by virtue of factors such as its nature, scale or

location, these powers are further supplemented by the procedures set out in the EIA Regulations.

5.2.6 The following key principles should underpin the EIA of individual development proposals, and are further considered within this Planning Advice Note:

**Integration ( section 4)**
Meeting the requirements of the EIA Regulations should form the starting point for any EIA, and timing and delivery of EIA outputs at appropriate stages in the wider development management process are key to achieving this. At the same time, Planning Authorities, the Consultation Bodies, and developers alike will wish to ensure the full benefits of EIA are realised through the early consideration of environmental issues before any planning application is submitted. EIA is an iterative process which aims to ensure early consideration of environmental issues at all stages of project development. In this way, EIA can lead to improvements in design, including the integration of mitigation measures, which can lead to cost and other resource savings. EIA can also generate added value by delivering net environmental gain, as well as providing a framework for engaging with the public.

**Proportionality ( section 5)**
EIAs should be fit for purpose. Excessively long, repetitive and poorly co-ordinated EIA Reports can prove a barrier to informed decision-making. EIA Reports are by their very nature technical documents, equally however they must be written in a manner that is accessible to the planning authority as the decision-maker; to the Consultation Bodies, and also to the public. Proportionality can best be achieved by seeking information from the planning authority and the Consultation Bodies on the scope of the assessment, paying attention to their views from the outset, and by focusing on the significant environmental effects of the proposed development. Developers and their agents, planning authorities and the EIA consultation bodies all have responsibilities in this respect.

**Efficiency ( section 6)**
Through its early consideration of the likely environmental effects of development plan allocations, SEA provides new opportunities to strengthen and streamline project level EIA, particularly at screening and scoping stages and by highlighting any strategic mitigation measures which may be relevant at project design stage. Early identification of other project-level assessment or information requirements, including any surveys required to be undertaken, can also help to identify opportunities for greater co-ordination, and help to minimise subsequent delays.

## 5.3 Assessment of Noise: technical advice note (TAN)

5.3.1 Technical Advice Note provides guidance which may assist in the technical evaluation of noise assessment. It has been prepared as a guide for noise professionals, both in the public and

private sector, in the preparation and evaluation of noise impact assessments. It does not offer prescriptive guidance on noise assessment, nor should it be considered as being exhaustive in extent. It aims to assist in assessing the significance of impact.

5.3.2 Good acoustic design and a sensitive and pragmatic approach to the location of new development needs to be actively promoted to ensure that quality of life is not unreasonably affected, and that new development continues to support sustainable economic growth in Scotland. Environmental Health Officers and/or acousticians should be involved at an early stage in development proposals which are likely to have significant adverse noise impacts or be affected by existing noisy developments.

5.3.3 In the context of this document the following terms are defined:

Noise impact assessment is a process which identifies and evaluates the key noise impacts of a development for the purposes of informing its design and the planning decision process.

Noise Management Areas are designated areas where the noise impact from environmental sources has been identified for noise action plans as a requirement of the European Directive for the Assessment and Management of Environmental Noise 2002/49/EC ( END).

Quiet Areas are designated areas where the quality of the environmental noise is good and should be preserved against an increase in noise as required under the END Directive.

## 5.4 East Lothian Local Plan (2018)

5.4.1 Noise can adversely affect amenity, public health and environmental quality. Such noise impacts are to be mitigated in new development. The Scottish Government's Strategic Noise Maps show that East Lothian has a number of noise sources, including the A1(T) and operational railway lines. Some types of development can also generate significant noise levels, including on a temporary basis such as during construction. Applicants are encouraged to contact the Council's Environmental Protection Service at an early stage to confirm whether a Noise Impact Assessment, consistent with PAN 1/2011: Planning and Noise (or any revision) is required as part of their proposal. Where such an assessment indicates that noise is likely to be an issue there will be a need for appropriate mitigation.

5.4.2 Policy NH13: Noise The impact of noise will be taken into account when assessing relevant development proposals, particularly those that are close to or could become a source of noise. A noise impact assessment will be required where the proposed development may cause or exacerbate existing noise levels or be sensitive to levels of noise in the area. The assessment must specify suitable and appropriate mitigation measures that would make the proposal acceptable. Development proposals that would either result in or be subject to unacceptable levels of noise will not be supported.

5.4.3 The Environmental Health Officer for East Lothian Council has suggested the following guidelines.

- *I would suggest for external amenity BS4142 assessment would be appropriate with The Rating Level, LArTr, of noise associated with the operation of the proposed facility when measured 3.5m from the façade of any neighbouring residential property, shall be no more than 5dB (A) above the background noise level, LA90,T. All measurements to be made in accordance with BS 4142: 2014 "Methods for Rating and Assessing Industrial and Commercial Sound."*

- *I would also suggest for internal amenity Noise arising from any proposed plant or equipment associated with the development shall not exceed Noise Rating Curve NR 20 at any Octave Band Frequency when measured within any neighbouring residential property assuming windows open at least 50mm. This is due to the likelihood of the facility operating during the night.*

## 5.5 BS 4142:2014+A1:2019: Methods for Rating & Assessing Industrial & Commercial Sound

5.5.1 Any formal assessment of commercial noise affecting residential properties would in all likelihood be based upon the recommendations of British Standard 4142:2014+A1:2019 "Methods for rating and assessing industrial and commercial sound".

5.5.2 In brief, this rating method determines "specific sound level" generated by the new plant, assessed immediately outside the residential properties most likely to be affected. For daytime (07.00 – 23.00) only operation of the new plant, this would be the equivalent continuous noise level of the new noise, evaluated over a 1-hour sampling period, its $L_{Aeq,1hr}$. For plant operating during the night-time (23.00 – 07.00) only the reference time interval is 15 minutes.

5.5.3 Corrections of up to + 9 dB (A) are then made to this "specific sound level" if the new noise has certain acoustic features such as tonality, impulsivity, intermittency and any other sound characteristics, to give the "rating level".

5.5.4 An assessment of the impact of the specific sound level can be determined by subtracting the measured background level from the rating level and consider the following.

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

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

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

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant

adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

*NOTE: Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*

5.5.5 It is likely that the Local Authority would seek to avoid marginal situations at the planning stage and may try to ensure a positive likelihood that no complaints would be forthcoming. As such, they might recommend a noise target which limits the Rating Noise Level to a maximum which is as low as 5 - 10 dB(A) below the minimum background level currently experienced.

5.5.6 However, there are limitations to BS4142 if noise levels are very low, and in such circumstances, it may not be necessary to follow the normal guidance in order to achieve this aim. Indeed, within the Scope of the Standard, it is stated:

*"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low.*

*Note: for the purpose of this Standard, background noise levels below about 30 dB and rating noise level below about 35 dB are considered to be very low."*

## 5.6 BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

5.6.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation such as this. Typical advice is found in British Standard 8233:2014 “Guidance on Sound Insulation and Noise Reduction for buildings.” Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

| Activity | Location | 0700 - 2300 | 2300 - 0700 |
|---|---|---|---|
| Resting | Living Room | 35 dB(A) LAeq, 16 hr | - |
| Dining | Dining room/Area | 40 dB(A) LAeq, 16 hr | - |
| Sleeping | Bedroom | 35 dB(A) LAeq, 16 hr | 30 dB(A) LAeq, 8 hr |

**Table 5.2 – BS8233 Residential Criteria, Internal**

5.6.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)[2]. Therefore the 'good' internal standards quoted above would broadly equate to the following targets immediately outside the buildings:

[2] Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

| Activity | Location | 0700 - 2300 | 2300 - 0700 |
|---|---|---|---|
| Resting | Living Room | 48 dB(A) LAeq, 16 hr | - |
| Dining | Dining room/Area | 53 dB(A) LAeq, 16 hr | - |
| Sleeping | Bedroom | 48 dB(A) LAeq, 16 hr | 43 dB(A) LAeq, 8 hr |

**Table 5.3 – BS8233 Residential Criteria, Extrapolated External**

5.6.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.

5.6.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.

5.6.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute noise level within a building will be different if the introduction of the noise source post-dates the construction of the building. Other factors may be relevant in certain circumstances, and they are covered in large part by BS4142, discussed above.

5.6.6 In respect of office buildings, BS8233 indicates that noise levels within private offices should not exceed 35 - 40 dB(A) $L_{Aeq}$. Adopting a typical loss of 13 dB(A) through an open window, this target equates to an equivalent level of 48 - 53 dB(A) $L_{Aeq}$ externally.

## 5.7 World Health Organisation Guidelines

5.7.1 Further advice is provided in the 1999 WHO report "Guidelines for Community Noise".

5.7.2 This indicates that the steady noise level in external amenity areas, such as gardens or outdoor living areas should not exceed 55 dB(A) $L_{Aeq, t}$, and should preferably be designed below 50 dB(A) $L_{Aeq, t}$.

5.7.3 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) $L_{Amax}$ inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) $L_{Amax}$ externally.

# 6. ASSESSMENT OF PREDICTED NOISE LEVELS

## 6.1 Residential Properties

6.1.1 Based on the attenuation recommendations stated in Paras 4.4, the most onerous prediction of noise at the nearest residential receptor (Thurston Mains Cottage) is 24 dB(A) on the ground floor (Living Room) during the daytime and 26 dB(A) on the upper floor (Bedroom) at night-time.

6.1.2 In absolute terms, it is confirmed that such levels are 24 dB lower than the recommended standard indicated by BS8233 for daytime operation (ref. Para 5.6.2) and 17 dB lower than the equivalent night-time level.

6.1.3 In respect of the guidelines of BS4142, a formal assessment of the predicted noise would be as follows:

| | Daytime Operation | Night-Time Operation |
|---|---|---|
| Predicted Facade Noise Level[3], $L_{Aeq,t}$ | 24 dB(A) | 26 dB(A) |
| Correction for Tonality[4] | +2 dB | +2 dB |
| Rating Level | 26 dB(A) | 28 dB(A) |
| Minimum Background Level, $L_{A90}$ | 30 dB(A) | 24 dB(A) |
| East Lothian Council Target Noise Level | 35 dB(A) | 29 dB(A) |
| **RATING over BACKGROUND** | **-4 dB** | **+4 dB** |

**Table 6.1 – BS4142 Assessment for Nearest Residential Property (attenuated plant)**

6.1.4 Table 6.1 confirms that the predicted Rating Level will meet the requirements of East Lothian Council.

6.1.5 In respect of the internal amenity noise, Table 6.2 shows the comparison of the predicted noise level against the NR20 Noise Rating Curve and confirms that the internal noise levels are lower than the NR20 Rating Curve at the majority of the octave band centre frequencies and would therefore meet the requirements of East Lothian Council.

| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---|---|---|---|---|---|---|---|---|
| Predicted Internal Noise Level | 46 | 30 | 27 | 24 | 21 | 14 | -1 | -43 |
| NR20 Spectrum | 51 | 39 | 31 | 24 | 20 | 17 | 14 | 13 |

**Table 6.2 – Comparison of Predicted Internal Noise Levels v NR20 Spectrum**

6.1.6 Finally, it is confirmed that the predicted noise levels within amenity spaces linked to the NSRs will fall well below the lower threshold values offered in the WHO guidance.

[3] For daytime operation, a ground floor receiver is considered. For night-time operation, noise levels at 1st floor windows are assessed.

[4] BS4142 Correction for tonality which is clearly perceptible.

## 6.2 Commercial Properties

6.2.1 There may will be commercial buildings adjacent to the proposed site although they would not be any closer than the residential properties identified, and Table 4.3 has confirmed the predicted attenuated noise levels at these.

6.2.2 The most onerous predicted daytime noise level is 24 dB(A), and this level is comfortably below the recommended guideline limits of BS8233 (para 5.6.6)

## 7. UNCERTAINTY

7.1 The variability or uncertainty in each element of this noise assessment needs to be considered, the measurements themselves, the noise predictions and the assessment of likely impacts. Guidance and good practice are given within BS4142:2014 (Method of rating and assessing industrial and commercial sound) Annex B for reducing uncertainty.

7.2 The table below provides a discussion of the key points relating to uncertainty for this assessment:

| Consideration | Comments |
|---|---|
| Complexity of the sound source and the residual acoustic environment | The noise sources emanate a relatively constant level of noise when operating, allowing for a secure assessment. As a predictive assessment, rather than an in-situ measurement, the source data provides a robust baseline for the calculation. |
| Measurements Location and Duration | Ambient background noise survey was conducted over a 72hr period, including daytime and night-time. |
| Weather Conditions | In respect of the specific measurements, weather conditions were favourable. |
| Instruments | All instruments used were Class 1 sound level meters, carrying valid third-party calibration. All instruments were calibrated before and after the surveys were undertaken. |
| Calculations | All calculations have been completed using an industry standard noise mapping software (INoise) which implements validated calculation methodologies.<br>Open land has been modelled as soft, in line with a conservative approach in estimating ground absorption effects over distance. |
| Overall | It is considered that the assessment will be accurate to a level of +/- 3 dB |

**FIGURE 1 – SITE LOCATION**

## FIGURE 2 – PROPOSED SITE LAYOUT

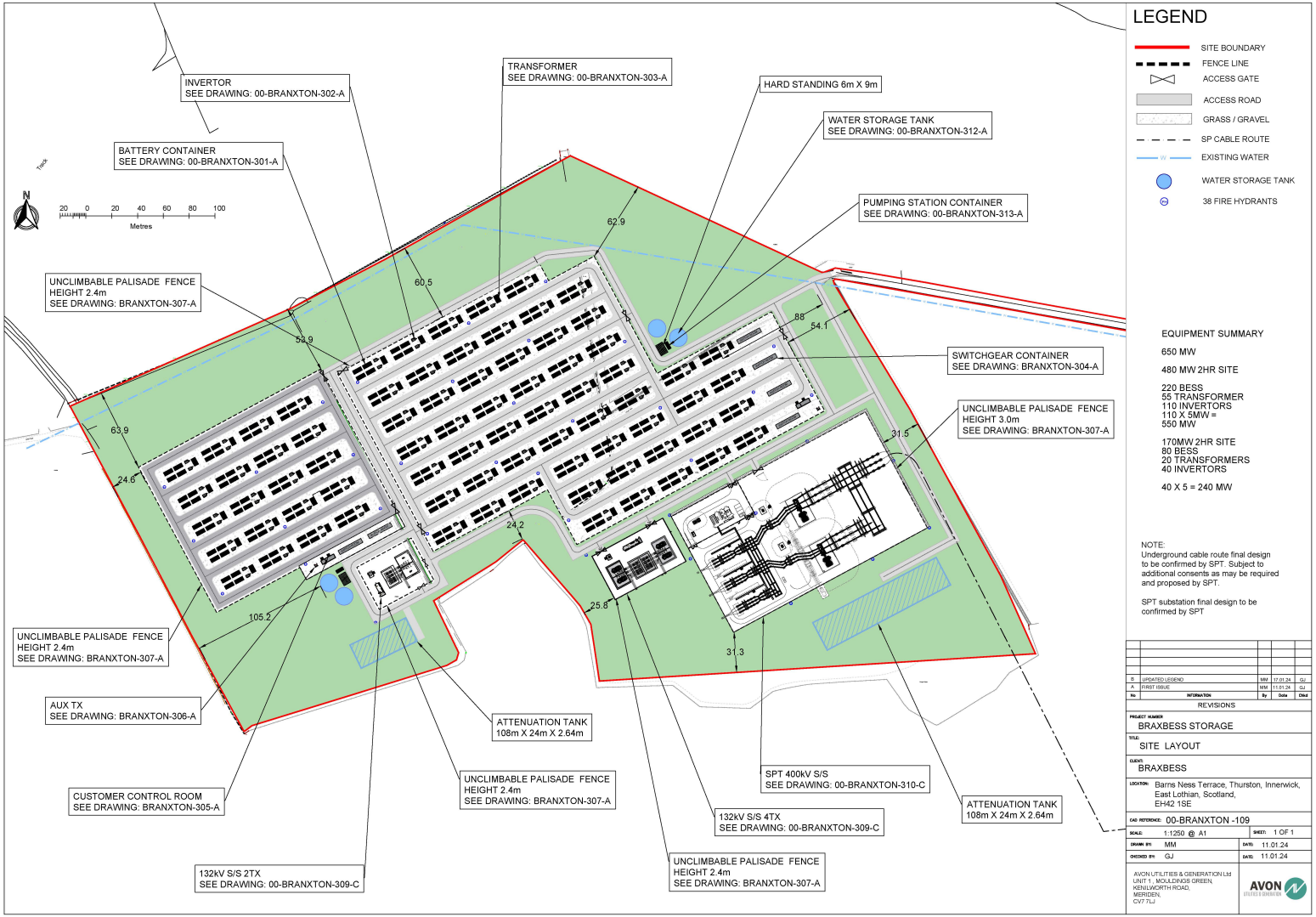
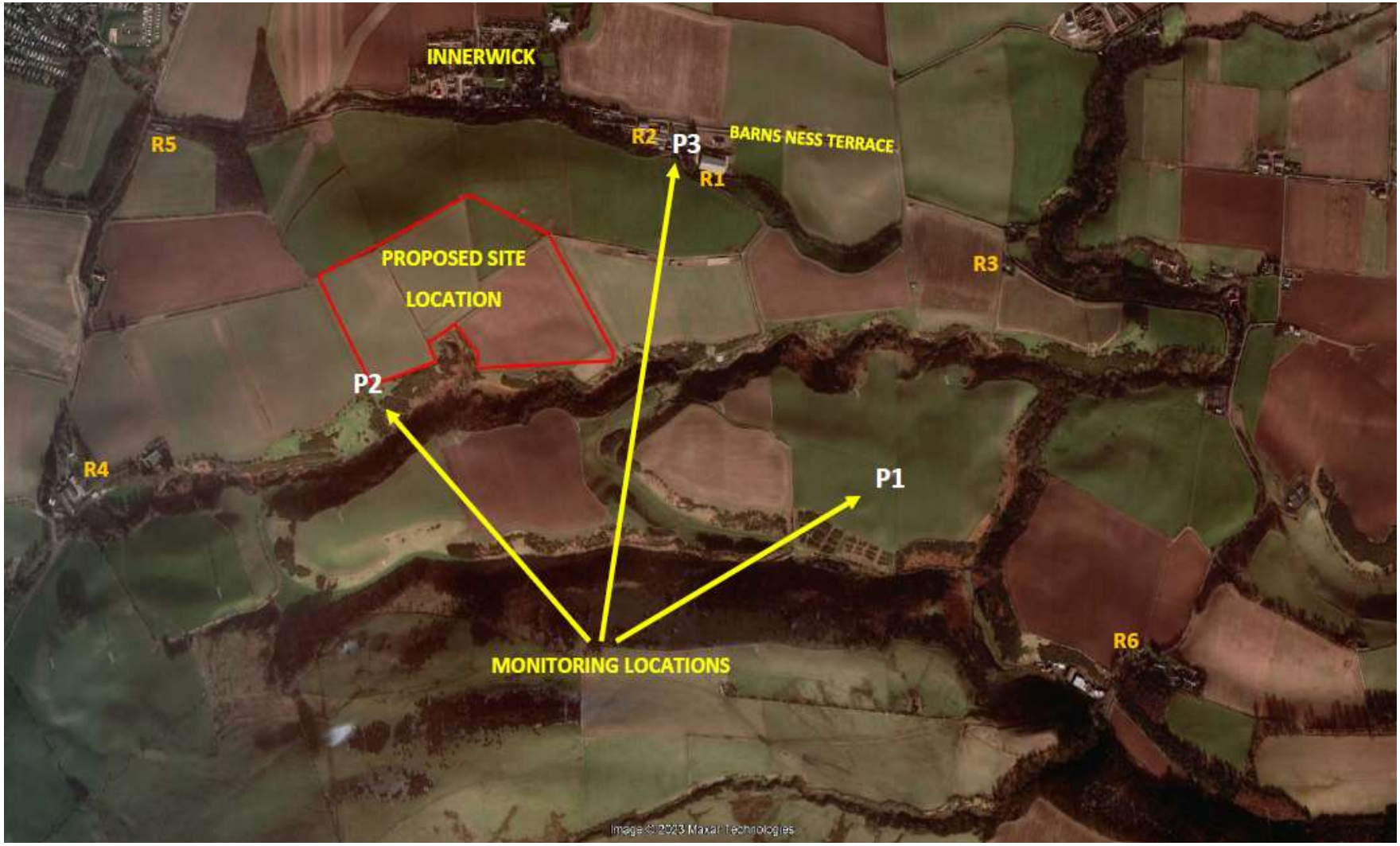
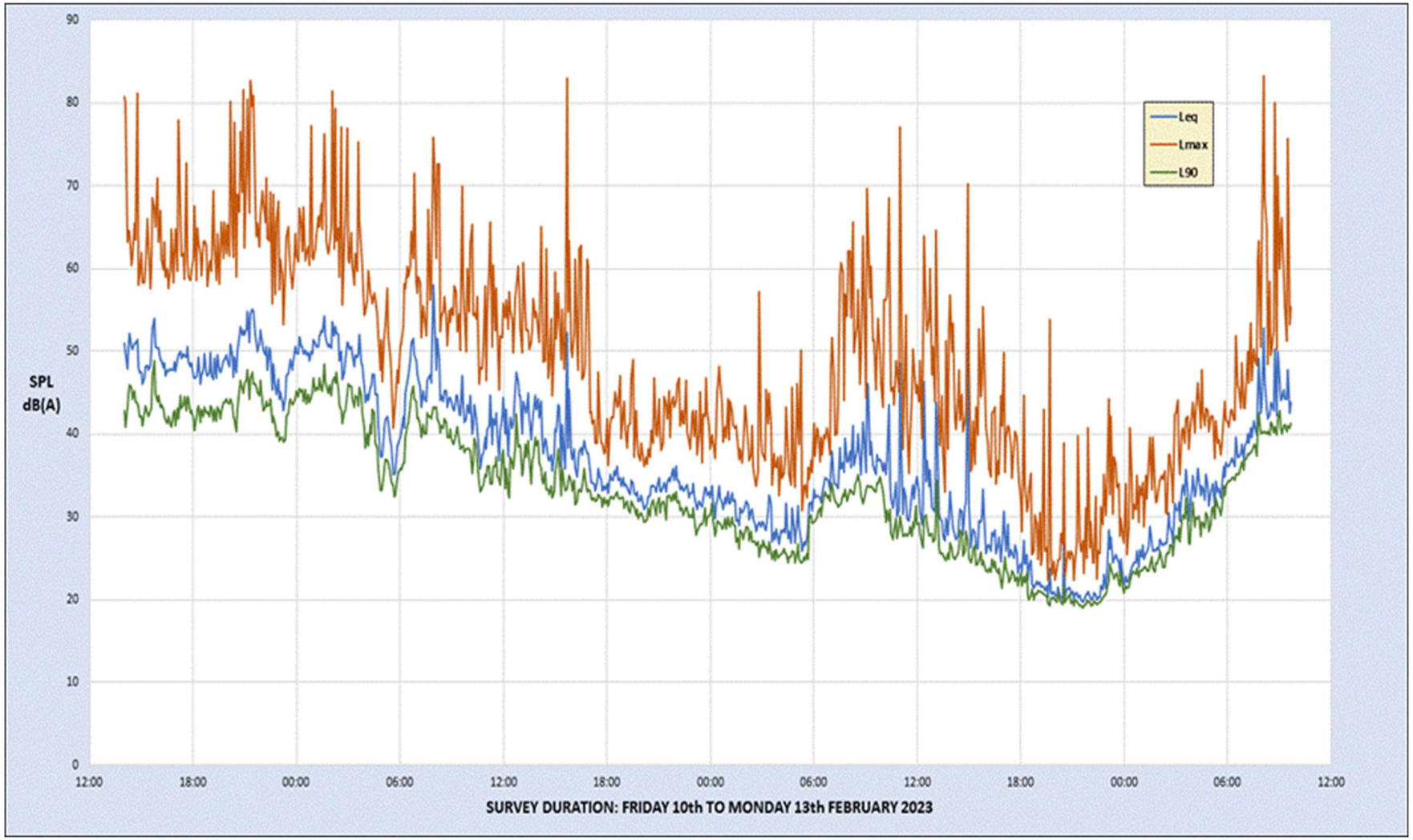


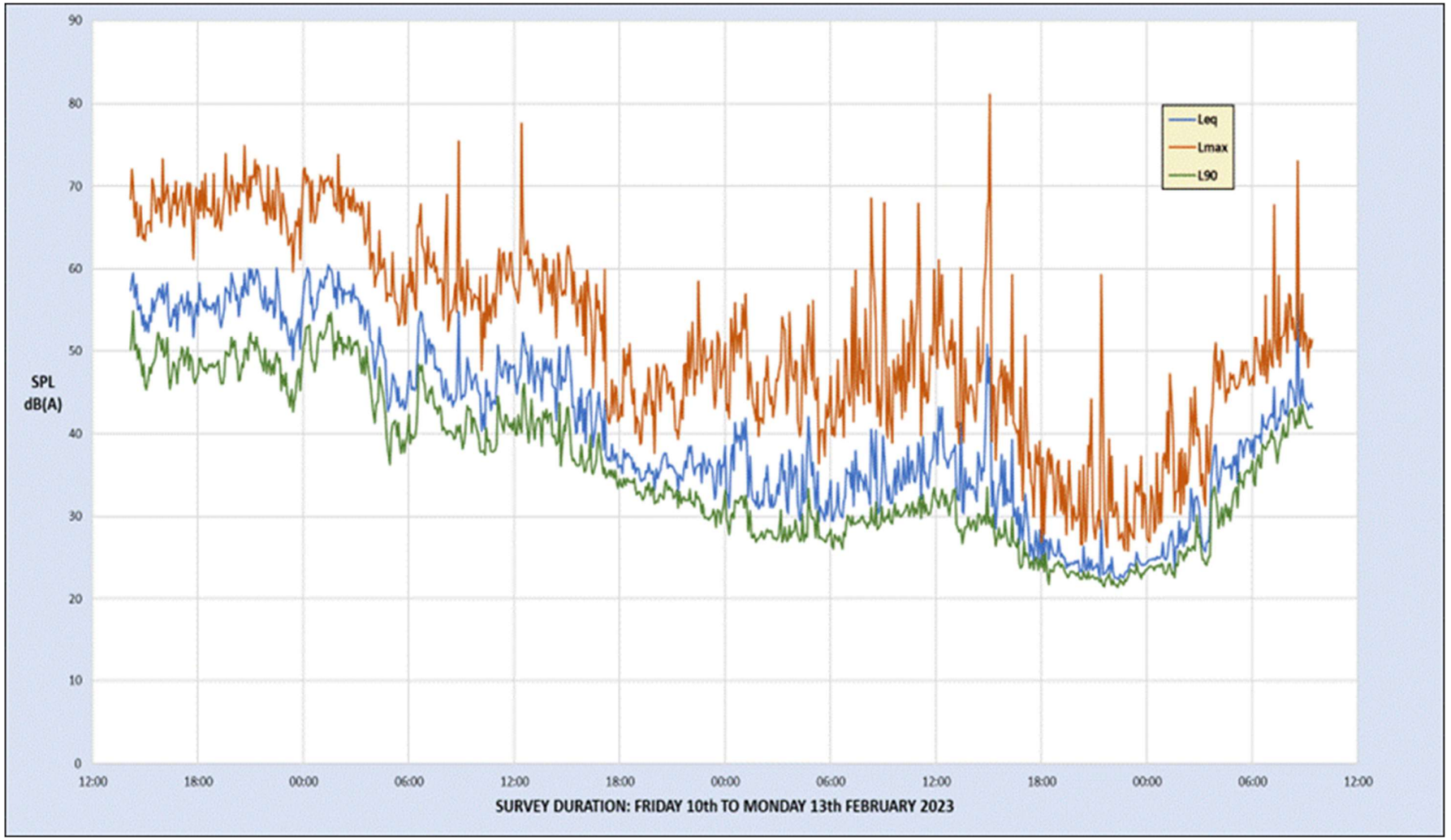
**FIGURE 3 – MONITORING LOCATION**



## FIGURE 4 – VARIATION OF AMBIENT NOISE LEVELS: P1



## FIGURE 5 – VARIATION OF AMBIENT NOISE LEVELS: P2



## FIGURE 6 – VARIATION OF AMBIENT NOISE LEVELS: P3

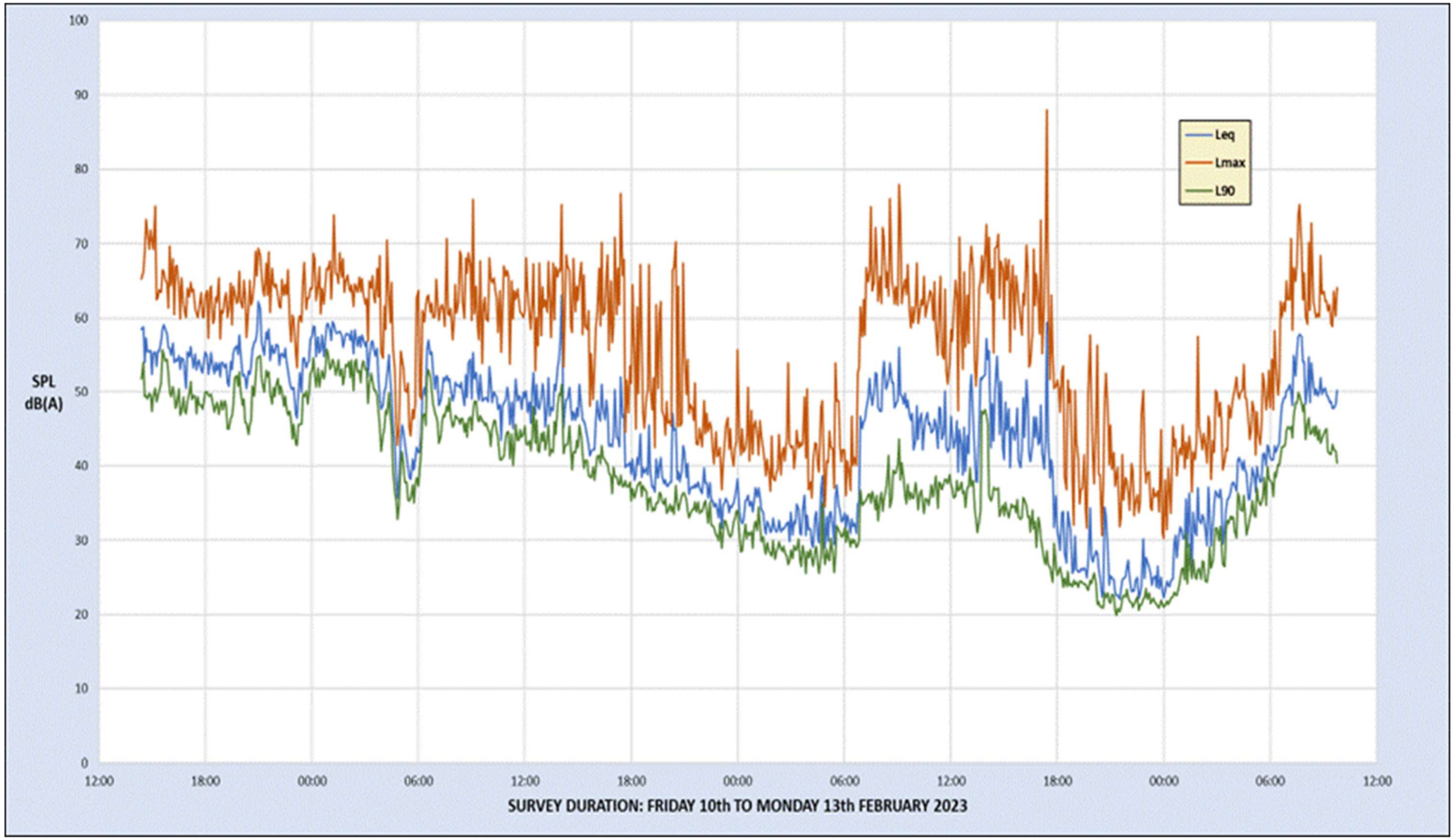


**FIGURE 7 – ATTENUATED DAYTIME NOISE MAP**

**FIGURE 8 – ATTENUATED NIGHT-TIME NOISE MAP**