# 33/11kV Substation
## Wood Road
## Nailstone
## Coalville
## LE67 1HY

# Transformer Noise Impact Assessment

On behalf of

ALDI

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T: 01252 519881
W: noisesolutions.co.uk
E: hello@noisesolutions.co.uk
Noise Solutions Ltd, Unit 5, Oriel Court, Omega Park, Alton GU34 2YT Reg no. 3483481

## Document Information

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| **Prepared by:** | Nigel Chandler | BSc(Hons), MIOA | NAC | 21st November 2024 |
| **Reviewed and approved by:** | Dean Bowden | BSc(Hons), MIOA | DMB | 21st November 2024 |
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Reg no. 3483481 Trading office Unit 5, Oriel Court, Omega Park, Alton GU34 2YT

# Contents



## Appendices

# 1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Aldi Stores Limited to undertake a noise impact assessment in relation to a proposed new substation at Wood Road, Nailstone, Leicestershire.

1.2. An environmental noise survey was undertaken to establish prevailing noise levels affecting the nearest noise-sensitive receptors to the proposed substation.

1.3. Noise emission levels for the proposed transformers have been predicted at the nearest noise sensitive receptors and assessed using the method described in BS 4142:2014+A1:2019.

1.4. The scope of the assessment and the location and duration of the noise survey have been agreed with the local authority's environmental health department.

1.5. To assist with the understanding of this report a glossary of acoustic terms can be found in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at http://www.acoustic-glossary.co.uk.

# 2.0 Site layout and development proposals

2.1. The existing Aldi distribution centre is located on the west side of Wood Road in Nailstone, Leicestershire. It is proposed to construct a new substation at the north end of the site.

2.2. The proposed site layout is shown in **Appendix D**. The installation will comprise two external transformers (referenced T1 and T2) and a 33/11kV substation building. Two existing transformers and a substation building at the west end of the site will be retained.

2.3. From discussions with National Grid Electricity Distribution (NGED) it has been established that any noise emanating from the site will be due to the two transformers. Type-test information for similar equipment has been provided and is shown in **Appendix E**. The transformers will generally operate under the "ONAN" conditions set out, with fans only running under the CER "continuous emergency rating" in the event of emergencies, when one transformer is out of service or maintenance is being conducted.

# 3.0 Nearest noise sensitive receptors

3.1. The nearest houses (Receptor R1) to the substation are on the east side of Wood Road, approximately 22m from the closest part of Transformer T2.

3.2. While there is some vegetation between these houses and the substation it is not considered

likely to provide any acoustic attenuation.

3.3. **Appendix B** contains an aerial photograph showing the site and surrounding area.

# 4.0 Existing noise climate

## Environmental sound levels

4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptor to the proposed substation during the quietest times at which plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

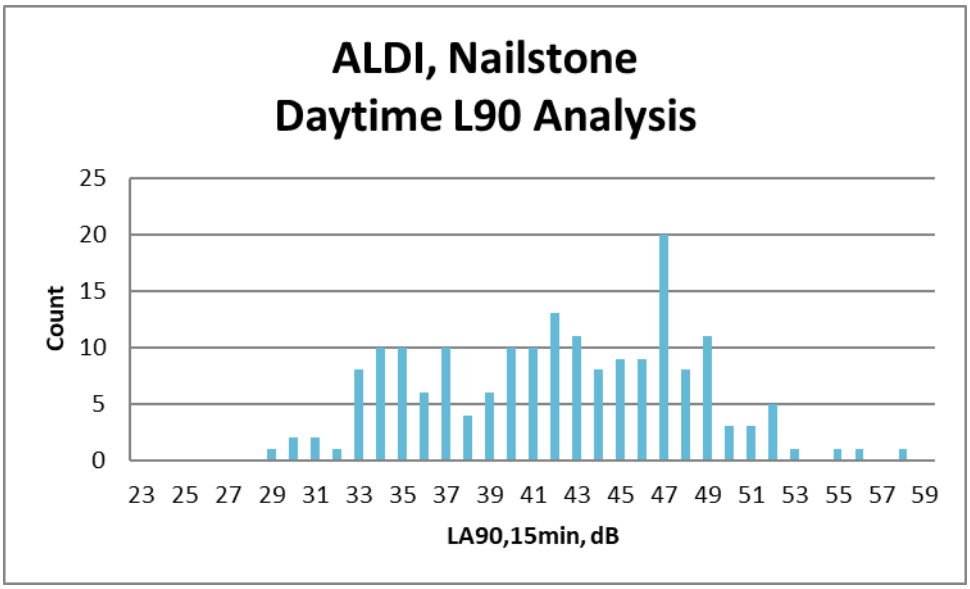
*Table 1 Summary of survey results*

| Measurement period | Range of recorded sound pressure levels (dB) | | | |
|---|---|---|---|---|
| | $L_{Aeq(15mins)}$ | $L_{Amax(15mins)}$ | $L_{A10(15mins)}$ | $L_{A90(15mins)}$ |
| Daytime (07.00 – 23.00 hrs) | 55-78 | 78-105 | 39-83 | 29-58 |
| Night-time (23.00 – 07.00 hrs) | 31-73 | 41-93 | 30-78 | 24-46 |

## Background sound levels

4.3. An analysis of background sound levels in the area is shown in the following charts and tables.

*Figure 1 Histogram of daytime $L_{A90}$ background sound pressure levels*



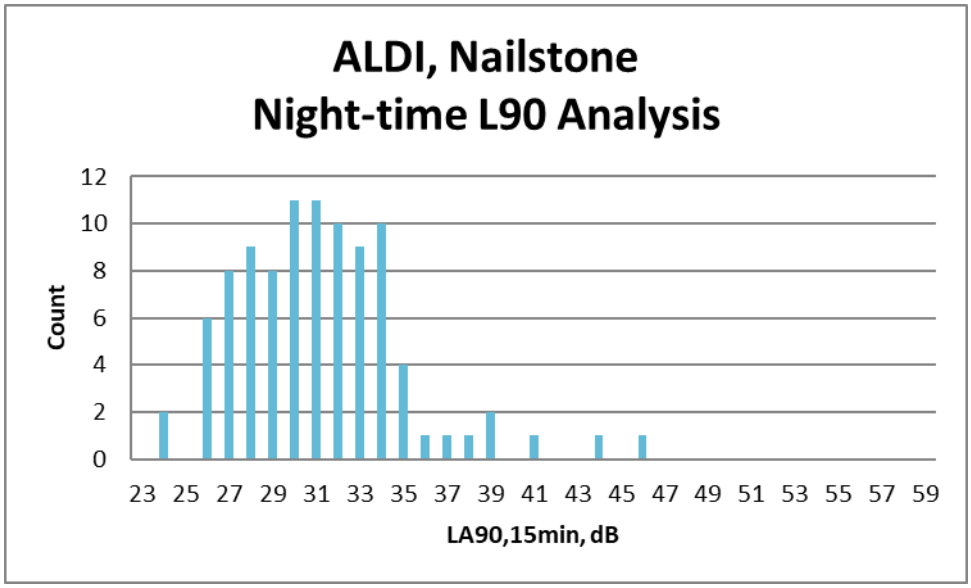
4.4. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

*Table 2 Statistical analysis of $L_{A90,15min}$ levels during the daytime period*

| dB, $L_{A90}$ daytime period | |
|---|---|
| **Mean** | 42 |
| **Mode** | 47 |
| **Median** | 42 |

*4.5.* From the histogram analysis, 33dB has been selected to be a robust representation of the background noise level during the daytime period.

*Figure 2 Histogram of night-time $L_{A90}$ background sound pressure levels*




4.6. Further statistical analysis has been carried out on the data and the mean and median values are shown in Table 3 below.

*Table 3 Statistical analysis of $L_{A90,15min}$ levels during the night-time period*

| dB, $L_{A90}$ night-time period | |
|---|---|
| **Mean** | 31 |
| **Mode** | 31 |
| **Median** | 31 |

4.7. From the histogram analysis, 27dB has been chosen to be a robust representation of the background sound level during the night-time period.

## Summary

4.8. Therefore, the following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 33dB $L_{A90}$ during the daytime period;
- 27dB $L_{A90}$ during the night-time period.

# 5.0 Planning Policy Context

## National Planning Policy Framework

5.1. A new edition of the NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The December 2023 revised edition contains no new directions or guidance with respect to noise. The paragraph references quoted below relate to the December 2023 edition.

5.2. Paragraph 180 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land instability."*

5.3. The NPPF goes on to state in Paragraph 191:

*" planning policies and decisions 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 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 ...*

5.4. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.5. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

*5.6.* Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually*

[1] National Planning Policy Framework, DCLG, March 2012
[2] Noise Policy Statement for England, DEFRA, March 2010

*be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed"*.

5.7. Paragraph 123 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land"*.

## Noise Policy Statement for England

5.8. The Noise Policy Statement for England (NPSE[3]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

5.9. The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

5.10. The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: *"...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."*

5.11. Importantly, the NPSE goes on to state that: "This does not mean that such adverse effects cannot occur."

5.12. The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question.

[3] Noise Policy Statement for England, Defra, March 2010

NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

5.13. It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

## Planning Practice Guidance – Noise

5.14. An updated Planning Practice Guidance (PPG[4]) for noise was published on 22 July 2019 and provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

5.15. This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'disruptive', and should be 'avoided').

5.16. As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

5.17. The LOAEL is described in PPG[5] as the level above which *"noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard"*.

*5.18.* PPG identifies the SOAEL as the level above which *"noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present."*

[4] Planning Practice Guidance – Noise, https://www.gov.uk/guidance/noise--2, 22 July 2019
[5] Paragraph: 005 Reference ID: 30-005-20190722

5.19. In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG[6] acknowledges that *"...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."*

5.20. The relevant guidance in the PPG in relation to the adverse effect levels is summarized below:

*Table 4 PPG Noise response table*

| Response | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| **No Observed Effect Level** | | | |
| **Not Present** | No Effect | No Observed Effect | No specific measures required |
| **No Observed Adverse Effect Level** | | | |
| **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 perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| **Lowest Observed Adverse Effect Level** | | | |
| **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** | | | |
| **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 | Significant Observed Adverse Effect | Avoid |

[6] Paragraph: 006 Reference ID: 30-006-20190722

| Response | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| | 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. | | |
| **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 |

5.21. The Planning Practice Guidance[7] states the following in relation to mitigation measures:

> *"For noise sensitive developments, mitigation measures can include avoiding noisy locations in the first place; designing the development to reduce the impact of noise from adjoining activities or the local environment; incorporating noise barriers; and optimising the sound insulation provided by the building envelope."*

# 6.0 Noise criteria

## Hinkley and Bosworth Borough Council

6.1. The local authority has requested that a noise impact assessment is undertaken to accompany the planning application.

6.2. In discussions with the environmental health officer[8] it has been confirmed that:

- An environmental noise survey at the location used, over the course of a weekend, would permit a robust assessment, with the environmental sound levels not being unduly raised by close proximity to either the ALDI distribution centre or the existing substation;

[7] Paragraph: 010 Reference ID: 30-010-20190722

[8] Conversation with Giles Rawdon, 11th November 2024, and subsequent email

- An assessment using the method described in BS 4142:2014+A1:2019 is appropriate for the proposed installation.

## BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

6.3. BS 4142:2014 +A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014[9] includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

6.4. The procedure contained in BS 4142:2014 is to quantify the *"specific sound level"*, which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

6.5. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

6.6. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."*

6.7. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."*

6.8. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
- *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.*

[9] For brevity, references to BS 4142 and BS 4142:2014 should be read as BS 4142:2014 + A1:2019

*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.*

6.9. The standard does state that "*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.*"

6.10. The standard goes on to note that: *"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."*

6.11. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

*"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

6.12. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

# 7.0 Transformer noise impact assessment

7.1. For the proposed installation, the sound level at the most affected noise sensitive receptor has been predicted for both the normal (ONAN) and emergency/maintenance (ONAF/CER) modes. The assessment has taken into consideration distance attenuation.

7.2. From observation of other transformer installations it is considered likely that there may be some audible tonality at the nearest receptors and a 2dB feature penalty has therefore been included within the following assessments.

## Assessment – normal operation

7.3. Table 5 below presents the initial assessment of the likely impact during the daytime period in accordance with the BS 4142:2014 methodology at the worst-affected property, R1.

*Table 5 Assessment of predicted transformer noise levels at Receptor R1 using BS 4142:2014 during the night-time (normal operation)*

| Results | Night-time (23.00-07.00hrs) | Relevant Clauses of BS 4142: 2014 | Commentary |
|---|---|---|---|
| **Background Sound level** | $L_{A90}$ = 27dB | 8.1, 8.2 | Representative typical background sound level during the night-time, determined from a range of measurements |
| **Assessment made during the daytime, so the reference interval is one hour** | | 7.2 | |
| **Specific Sound Level** | $L_{Aeq,T}$ = 26dB | 7.3.6 | Calculation presented in Appendix F |
| **Acoustic Feature Correction** | +2dB | 9.2 | Tonality potentially just audible |
| **Rating Level** | (26+2) dB = 28dB | | |
| **Excess of Rating Level over background sound level** | (28-27) dB = +1dB | | |
| **Context** | Environmental noise levels and the predicted specific sound level of the substation are low and resulting internal levels within the nearest houses are likely to be below 20dBA | | |
| **Assessment of impact:** | Potential low impact during the very quietest periods of the night. | | |

7.4. The predicted specific sound level due to the substation is 26dB $L_{Aeq}$. The lowest night-time ambient sound level measured was 31dB $L_{Aeq\ 15min}$. The resulting combined sound level would therefore be 32dB $L_{Aeq\ 15min}$, representing a worst-case 1dBA increase in the ambient sound level. Since such a small increase in sound level is unlikely to be perceptible, the change in sound level would be between the No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) in the PPG Noise response table (Table 4 above) and therefore "*no specific [mitigation] measures [are] required*"

## Assessment – emergency operation

7.5. NGED has advised that maintenance will occur only on an irregular basis and, wherever possible, would be conducted during the daytime. The assessment in Table 6 is for the worst-case with T2 Transformer – that closest to the houses – operating at CER/ONAF conditions.

*Table 6 Assessment of predicted transformer noise levels at Receptor R1 using BS 4142:2014 during the daytime (emergency/maintenance operation)*

| Results | Daytime (07.00-23.00hrs) | Relevant Clauses of BS 4142: 2014 | Commentary |
|---|---|---|---|
| **Background Sound level** | $L_{A90}$ = 33dB | 8.1, 8.2 | Representative typical background sound level during the daytime, determined from a range of measurements |
| **Assessment made during the daytime, so the reference interval is one hour** | | 7.2 | |
| **Specific Sound Level** | $L_{Aeq,T}$ = 42dB | 7.3.6 | Calculation presented in Appendix F; worst-case with T1 off and T2 operating |
| **Acoustic Feature Correction** | +2dB | 9.2 | Tonality potentially just audible |
| **Rating Level** | (42+2) dB = 44dB | | |
| **Excess of Rating Level over background sound level** | (44-33) dB = + 11dB | | |
| **Context** | The transformers would operate at CER/ONAF mode for limited periods, and only under emergency or maintenance conditions | | |
| **Assessment of impact:** | Possible adverse impact, but for limited periods and only under abnormal conditions | | |

### Uncertainties

7.6. Where possible, uncertainty in the above assessments has been minimised by taking the following steps:

- The meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
- Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.
- Care was taken to ensure that the measurement positions were representative of the noise climate outside the nearby residential dwellings and not in positions where higher noise levels were present.

## 8.0 Conclusions

8.1. Noise Solutions Ltd (NSL) has been commissioned by Aldi Stores Limited to undertake an

assessment of the potential noise impact of a new substation at Wood Road in Nailstone, Leicestershire.

8.2. In support of these assessment works, a baseline noise survey was undertaken to determine the prevailing environmental noise levels at the nearest noise sensitive receptors to the substation during representative periods.

8.3. The assessment shows that under normal operating conditions, the rating level due to the transformers is predicted to be marginally (1dB) above the night-time representative background sound level at the nearest houses. This would be between the NOAEL and the LOAEL. Specific noise levels would be low and the noise effect would be below the LOAEL. As noted in PPG Noise, therefore, no specific noise mitigation measures are required.

8.4. While there may be an adverse noise impact when only one transformer is operating under CER conditions this would be limited to emergencies and maintenance only and is therefore not expected to represent a significant noise effect.

8.5. The assessment shows that noise from the proposed transformer installation will not result in a significant noise impact on the occupants of the nearest houses.

# Appendix A Acoustic terminology

| Parameter | Description |
|---|---|
| Ambient Noise Level | The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$). |
| Decibel (dB) | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions. |
| dB(A), $L_{Ax}$ | Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A). |
| Fast Time Weighting | Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds. |
| Free-field | Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres |
| Façade | Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade. |
| $L_{Aeq,T}$ | A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. |
| $L_{max,T}$ | A noise level index defined as the maximum noise level recorded during a noise event with a period T. $L_{max}$ is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response. |
| $L_{10,T}$ | A noise level index. The noise level exceeded for 10% of the time over the period T. $L_{10}$ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00. |
| $L_{90,T}$ | A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level. |

## Appendix B Aerial photograph of site

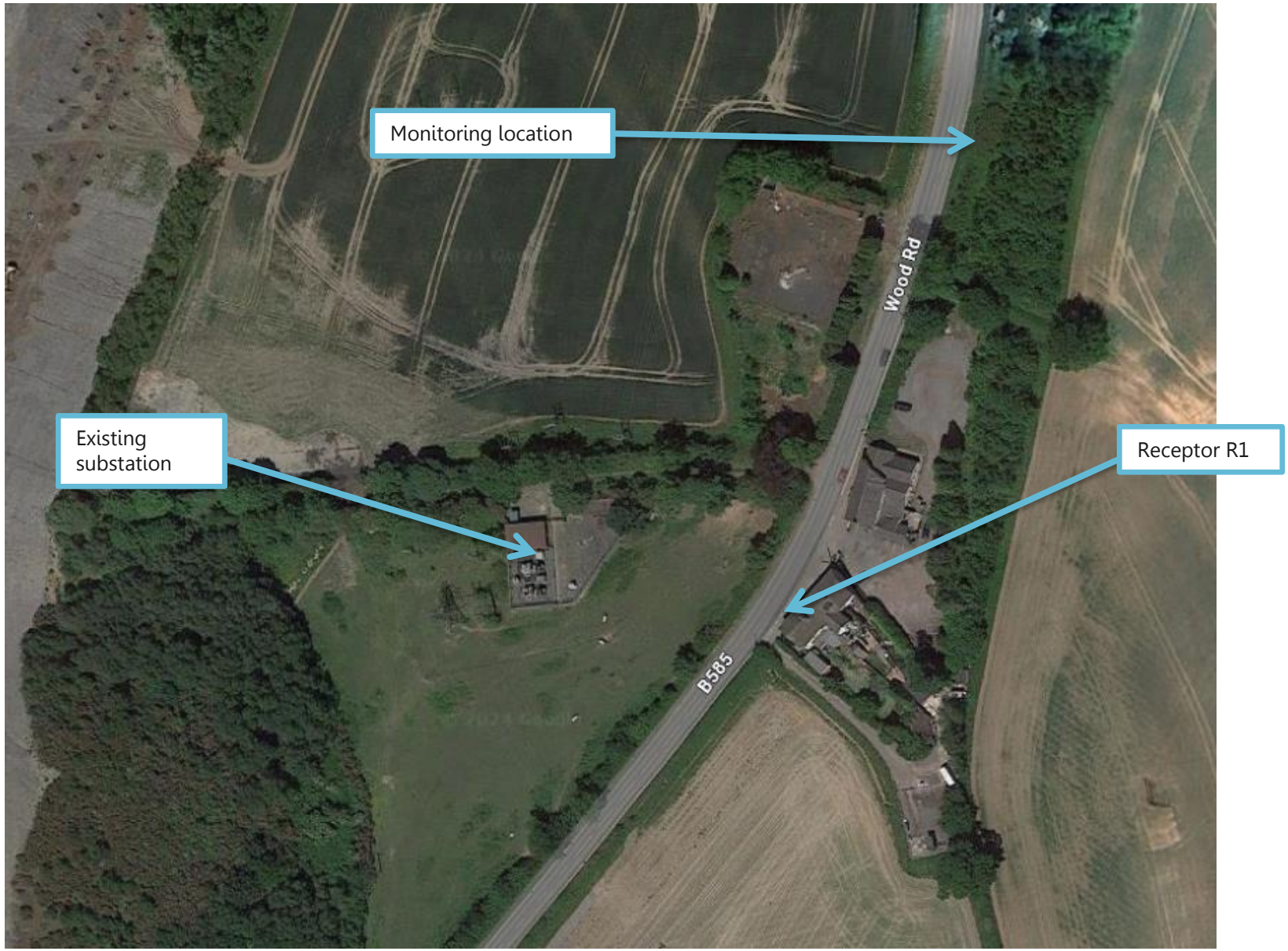



Image © Google 2024

# Appendix C Environmental sound survey

## Details of environmental sound survey

C.1 Measurements of the existing environmental sound levels were undertaken between 13.45 hours on Friday 15th November and 11.45 hours on Monday 18th November 2024.

C.2 The sound level meter was programmed to record the A-weighted $L_{eq}$, $L_{90}$, $L_{10}$ and $L_{max}$ noise indices for consecutive 15-minute sample periods for the duration of the noise survey.

## Measurement position

C.3 The representative measurement position was located on a lamp post on the east side of Wood Road, near to the houses closest to the site but minimising the possible influence of noise from the distribution centre (location indicated on the site plan in **Appendix B**). In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions. The survey location was close to the residential properties nearest to the site.

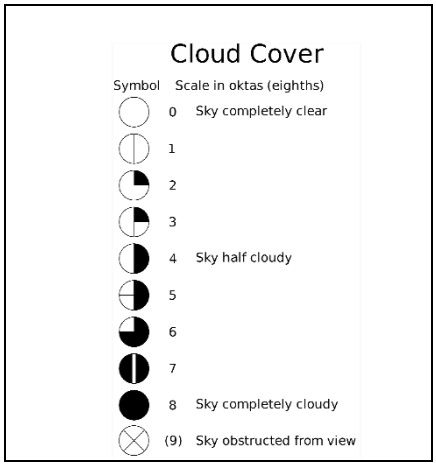
## Equipment

C.4 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change in the calibration level was noted.

| Description | Model / serial no. | Calibration date | Calibration certificate no. |
|---|---|---|---|
| Class 1 Sound level meter | Svantek 977/ 69747 | 05/08/2024 | 1509433-1 |
| Condenser microphone | ACO Pacific 7052E / 70829 | | |
| Preamplifier | Svantek SV12L / 73687 | | |
| Calibrator | Svantek SV30A / 10843 | 01/11/2024 | 1510142-2 |

## Weather conditions

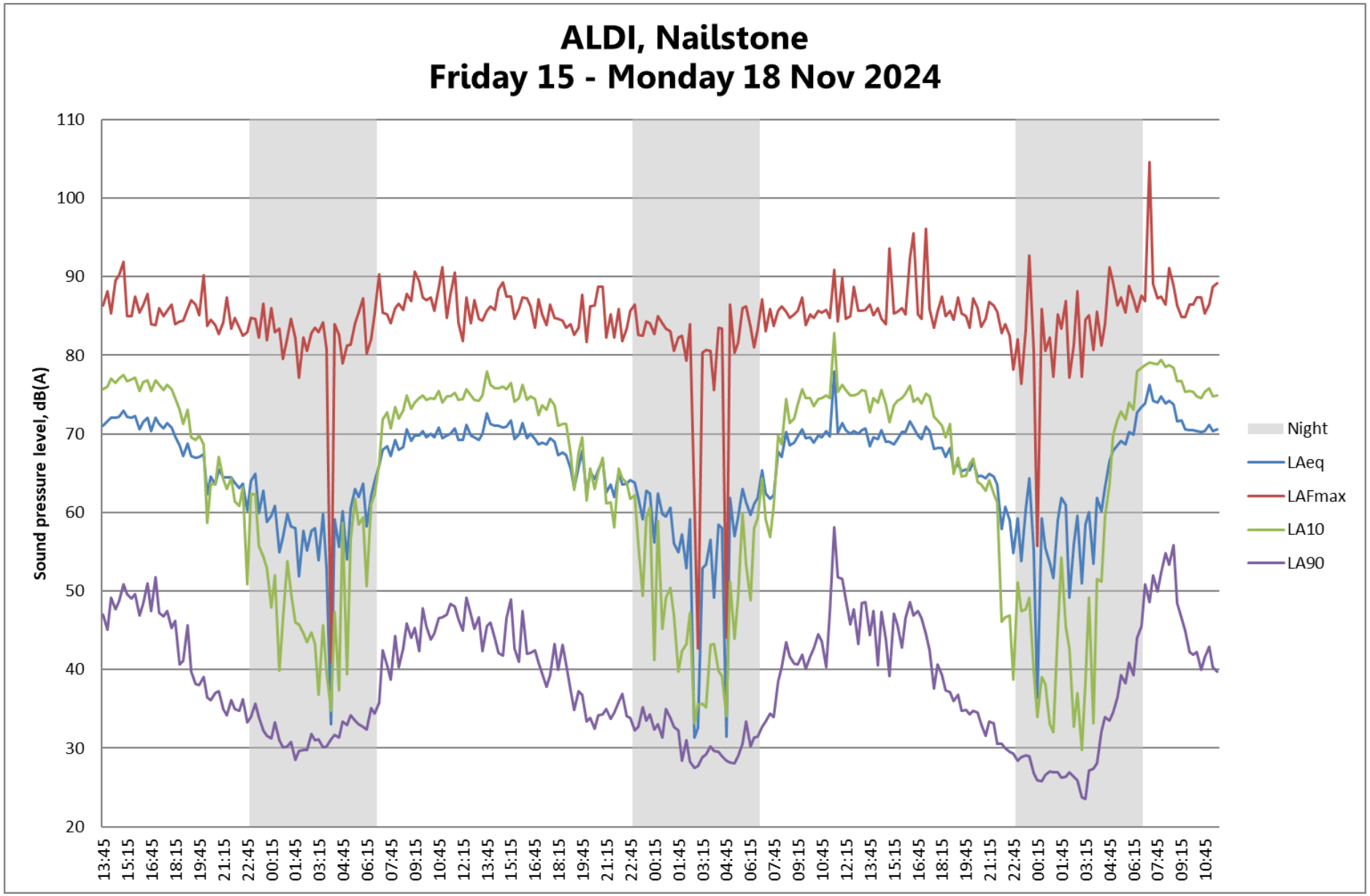
C.5 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

| Weather Conditions | | | | |
|---|---|---|---|---|
| **Measurement Location** | **Date/Time** | **Description** | **Beginning of Survey** | **End of Survey** |
| As indicated on Appendix C | 13.45 15 Nov - 11.45 18 Nov 2024 | Temperature °C | 8 | 4 |
|  | | Precipitation: | No | No |
| | | Cloud cover (oktas – see guide) | 8 | 8 |
| | | Presence of fog/snow/ice | No | No |
| | | Presence of damp roads/wet ground | No | Damp |
| | | Wind Speed (m/s) | 1.4 | 1.4 |
| | | Wind Direction | W | SE |
| | | Conditions that may cause temperature inversion (i.e. calm nights with no cloud) | No | No |

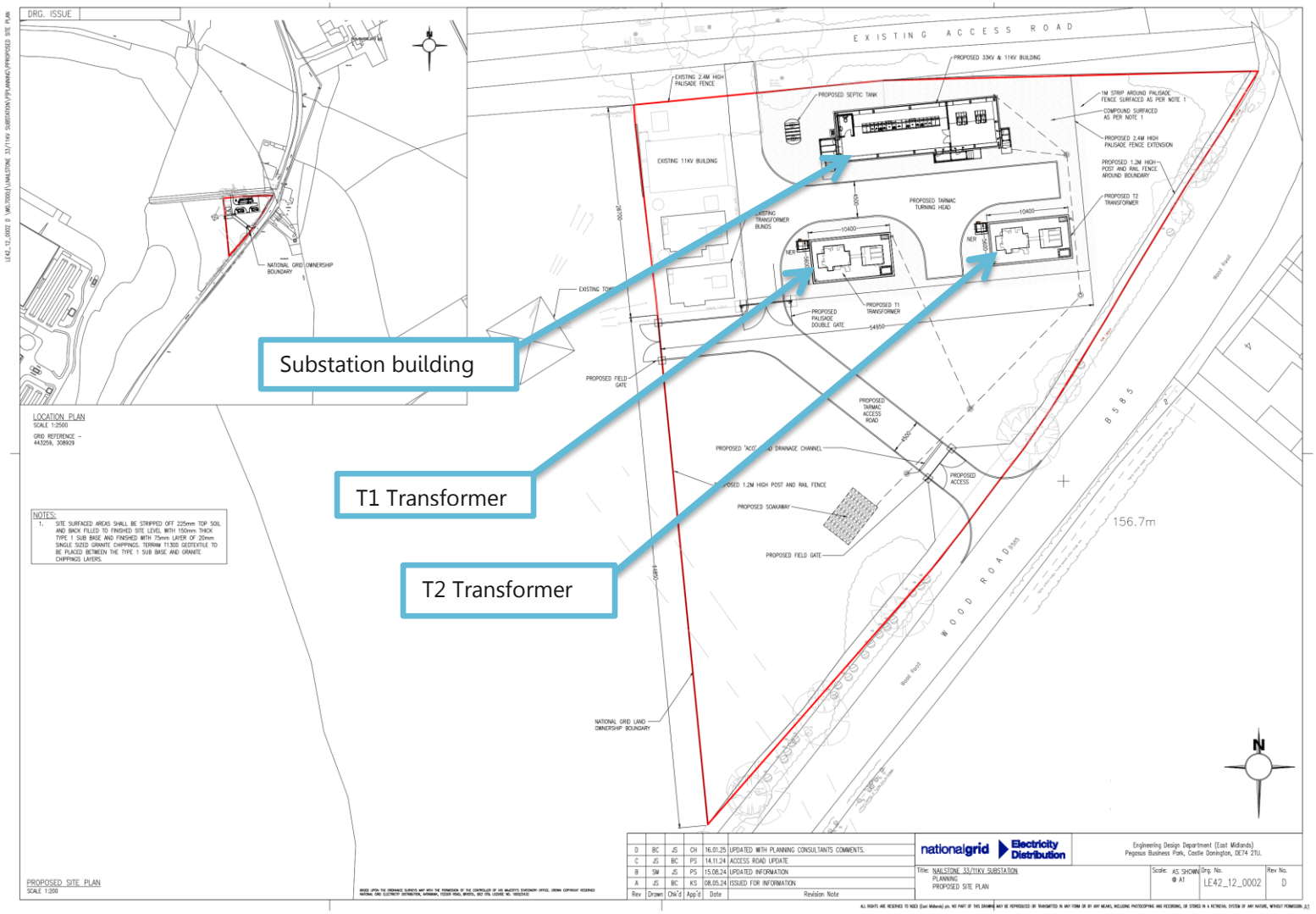


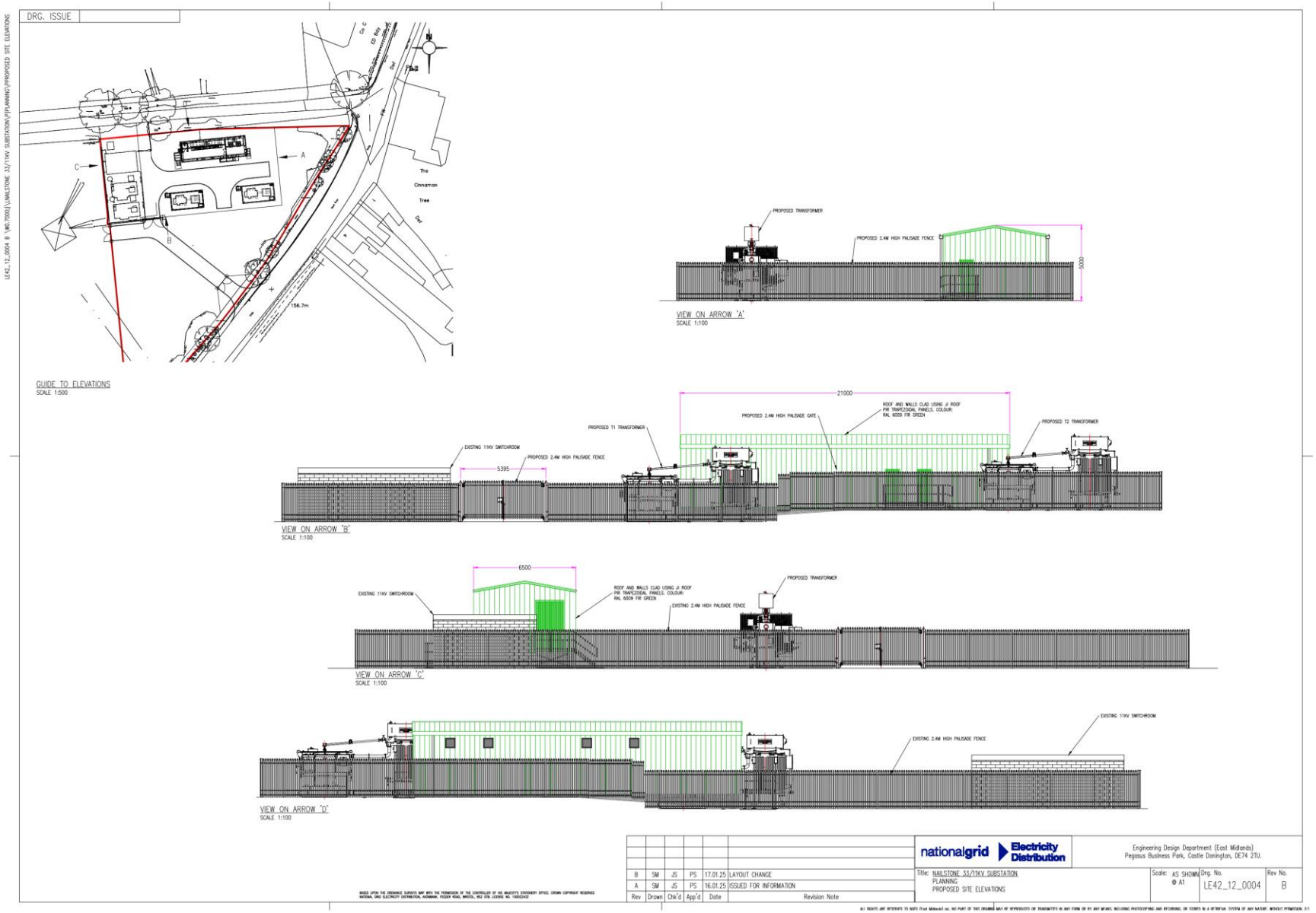
## Results

C.6 The results of the environmental survey are considered to be representative of the background sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the plant will operate. During the installation and removal of the equipment the main noise source was local road traffic, with distant traffic and light aircraft occasionally audible. The results of the survey are presented in a time history graph overleaf.


ALDI, Nailstone
Friday 15 - Monday 18 Nov 2024
Sound pressure level, dB(A)
110
100
90
80
70
60
50
40
30
20
13:45
15:15
16:45
18:15
19:45
21:15
22:45
00:15
01:45
03:15
04:45
06:15
07:45
09:15
10:45
12:15
13:45
15:15
16:45
18:15
19:45
21:15
22:45
00:15
01:45
03:15
04:45
06:15
07:45
09:15
10:45
Night
LAeq
LAFmax
LA10
LA90

# Appendix D Proposed substation layout




DRG. ISSUE
LE42_12_0004 B \\WD7000\L\NAILSTONE 33/11KV SUBSTATION\P\PLANNING\PROPOSED SITE ELEVATIONS
The Cinnamon Tree
156.7m
GUIDE TO ELEVATIONS
SCALE 1:500
PROPOSED TRANSFORMER
PROPOSED 2.4M HIGH PALISADE FENCE
5000
VIEW ON ARROW 'A'
SCALE 1:100
21000
ROOF AND WALLS CLAD USING JI ROOF PIR TRAPEZOIDAL PANELS. COLOUR: RAL 6009 FIR GREEN
PROPOSED 2.4M HIGH PALISADE GATE
PROPOSED T1 TRANSFORMER
PROPOSED T2 TRANSFORMER
EXISTING 11KV SWITCHROOM
5395
PROPOSED 2.4M HIGH PALISADE FENCE
VIEW ON ARROW 'B'
SCALE 1:100
6500
EXISTING 11KV SWITCHROOM
ROOF AND WALLS CLAD USING JI ROOF PIR TRAPEZOIDAL PANELS. COLOUR: RAL 6009 FIR GREEN
PROPOSED TRANSFORMER
EXISTING 2.4M HIGH PALISADE FENCE
VIEW ON ARROW 'C'
SCALE 1:100
EXISTING 11KV SWITCHROOM
EXISTING 2.4M HIGH PALISADE FENCE
VIEW ON ARROW 'D'
SCALE 1:100
B SM JS PS 17.01.25 LAYOUT CHANGE
A SM JS PS 16.01.25 ISSUED FOR INFORMATION
Rev Drawn Chk'd App'd Date Revision Note
nationalgrid Electricity Distribution
Engineering Design Department (East Midlands)
Pegasus Business Park, Castle Donington, DE74 2TU.
Title: NAILSTONE 33/11KV SUBSTATION
PLANNING
PROPOSED SITE ELEVATIONS
Scale: AS SHOWN @ A1
Drg. No. LE42_12_0004
Rev No. B

# Appendix E Transformer type test noise data

WINDER POWER
ENERGY DELIVERED

## Measurements Details

The transformer main tank is >2.5m high and measurements were taken at one and two thirds height at each measurement position.

Background
Measurements were made at 10 points equally spaced around the transformer.

ONAN
The length of path at 0.3m from the taut string outline was 24.5m and 24 measurements were made, equally spaced along the path.

ONAF
The length of path at 2.0m from the taut string outline was 32.34m and 32 measurements were made, equally spaced along the path.

The layout of the transformer during test is shown in the diagram below.

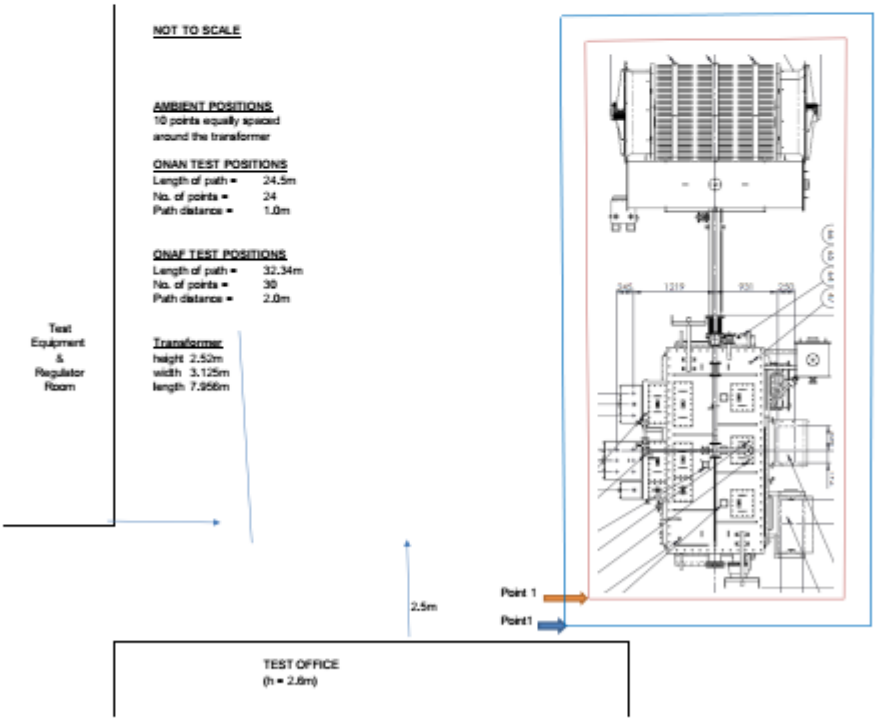



**Figure 1. Transformer Test Arrangement**

**Table 1. ONAN Test results (all values in dB(A))**

| Test Position | Ambient (Pre Test) | | Transformer | | Ambient (Post Test) | |
|---|---|---|---|---|---|---|
| | 1/3h | 2/3h | 1/3h | 2/3h | 1/3h | 2/3h |
| 1 | 44.6 | 46.7 | 48.2 | 47.8 | 46.7 | 46.7 |
| 2 | 47.7 | 47.0 | 49.4 | 48.3 | 46.3 | 45.9 |
| 3 | 46.5 | 45.7 | 50.8 | 49.0 | 47.2 | 49.2 |
| 4 | 46.5 | 46.4 | 52.3 | 49.2 | 47.1 | 47.1 |
| 5 | 45.4 | 44.9 | 53.8 | 52.5 | 45.2 | 48.4 |
| 6 | 45.1 | 45.4 | 55.2 | 54.5 | 45.9 | 45.7 |
| 7 | 44.1 | 44.2 | 51.3 | 49.4 | 45.2 | 44.4 |
| 8 | 45.7 | 45.5 | 48.2 | 49.2 | 46.3 | 43.7 |
| 9 | 45.3 | 45.4 | 51.8 | 50.7 | 46.0 | 45.9 |
| 10 | 45.4 | 45.4 | 49.9 | 49.8 | 47.3 | 46.0 |
| 11 | | | 51.3 | 48.3 | | |
| 12 | | | 49.5 | 48.5 | | |
| 13 | | | 49.3 | 47.1 | | |
| 14 | | | 50.3 | 48.8 | | |
| 15 | | | 50.7 | 51.2 | | |
| 16 | | | 47.7 | 46.6 | | |
| 17 | | | 48.8 | 49.2 | | |
| 18 | | | 46.3 | 46.7 | | |
| 19 | | | 47.1 | 46.0 | | |
| 20 | | | 47.8 | 47.3 | | |
| 21 | | | 46.2 | 47.2 | | |
| 22 | | | 48.4 | 47.2 | | |
| 23 | | | 47.0 | 47.3 | | |
| 24 | | | 48.2 | 48.4 | | |

Logarithmic mean of transformer noise measurements = 49.77dB(A)

Logarithmic mean of background noise measurements before test = 45.71dB(A)

Logarithmic mean of background noise measurements after test = 46.47dB(A)

The calculated transformer sound pressure level, LpA, at 0.3m based on an estimated prescribed contour of 24.5m is 42.21dB(A).

The calculated sound power level, LwA, of the transformer is **61.1dB(A).**

Customer specification required LwA = **65dB(A)**

The sound power measurement meets this requirement.

**Table 2. ONAF Test results (all values in dB(A))**

| Test Position | Ambient (Pre Test) | | Transformer | | Ambient (Post Test) | |
|---|---|---|---|---|---|---|
| | 1/3h | 2/3h | 1/3h | 2/3h | 1/3h | 2/3h |
| 1 | 47.1 | 48.5 | 65.8 | 65.9 | 48.1 | 47.5 |
| 2 | 45.0 | 47.7 | 65.5 | 65.4 | 47.0 | 47.8 |
| 3 | 47.8 | 45.7 | 64.7 | 64.7 | 48.8 | 46.9 |
| 4 | 46.1 | 46.5 | 64.3 | 64.2 | 48.1 | 46.7 |
| 5 | 46.4 | 46.7 | 62.9 | 63.4 | 46.7 | 48.7 |
| 6 | 45.4 | 45.7 | 62.0 | 62.1 | 44.9 | 45.7 |
| 7 | 46.2 | 46.4 | 61.1 | 61.1 | 45.9 | 44.6 |
| 8 | 44.9 | 44.6 | 60.6 | 59.9 | 45.5 | 44.9 |
| 9 | 44.4 | 45.7 | 59.7 | 59.5 | 45.3 | 45.0 |
| 10 | 44.4 | 44.5 | 59.4 | 59.0 | 45.5 | 44.7 |
| 11 | | | 58.8 | 58.3 | | |
| 12 | | | 59.0 | 57.9 | | |
| 13 | | | 58.9 | 58.1 | | |
| 14 | | | 58.5 | 59.0 | | |
| 15 | | | 59.4 | 59.2 | | |
| 16 | | | 59.4 | 59.2 | | |
| 17 | | | 60.0 | 59.8 | | |
| 18 | | | 60.5 | 60.0 | | |
| 19 | | | 60.9 | 61.5 | | |
| 20 | | | 62.0 | 62.4 | | |
| 21 | | | 62.2 | 61.8 | | |
| 22 | | | 62.6 | 62.4 | | |
| 23 | | | 65.0 | 65.3 | | |
| 24 | | | 64.7 | 65.5 | | |
| 25 | | | 64.5 | 65.0 | | |
| 26 | | | 64.3 | 64.1 | | |
| 27 | | | 64.1 | 64.0 | | |
| 28 | | | 64.8 | 63.5 | | |
| 29 | | | 64.0 | 63.0 | | |
| 30 | | | 64.6 | 64.5 | | |
| 31 | | | 65.3 | 65.1 | | |
| 32 | | | 65.2 | 65.7 | | |

Logarithmic mean of transformer noise measurements = 62.92dB(A)
Logarithmic mean of background noise measurements before test = 46.13dB(A)
Logarithmic mean of background noise measurements after test = 46.63dB(A)
The calculated transformer sound pressure level, LpA, at 2.0m based on an estimated prescribed contour of 32.34m is 56.0dB(A).
The calculated sound power level, LwA, of the transformer is **77.6dB(A).**

Customer specification required LwA = **80 dB(A)**
The sound power measurement meets this requirement.

# Appendix F Plant noise calculations

## Receptor R1 – Normal (ONAN) operation

| Transformer | Source sound power level, dBA | Distance (m) | Correction (dB) | Directivity (dB) | Screening (dB) | Sound pressure level at receptor |
|---|---|---|---|---|---|---|
| T1 | 61 | 45 | -41 | 0 | 0 | 20 |
| T2 | 61 | 26 | -36 | 0 | 0 | 25 |
| | | | | | **Combined sound pressure level at receptor** | **26** |

## Receptor R1 – CER operation

| Transformer | Source sound power level, dBA | Distance (m) | Correction (dB) | Directivity (dB) | Screening (dB) | Sound pressure level at receptor |
|---|---|---|---|---|---|---|
| T1 | 78 | 45 | -41 | 0 | 0 | 37 |
| T2 | 78 | 26 | -36 | 0 | 0 | 42 |
| | | | | | **Highest sound pressure level at receptor*** | **42** |

**the transformers will not operate simultaneously in CER mode*