Aldi store
Arndale
Manchester
M1 1WR

Plant Noise Impact Assessment

On behalf of

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1.0 Introduction

1.1. As part of a refurbishment programme, Noise Solutions Ltd (NSL) has been commissioned by Aldi Stores Limited to undertake a noise impact assessment in relation to proposed replacement external plant at the Aldi Arndale store in Manchester city centre.

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

1.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptors and assessed against the local authority's usual requirements.

1.4. 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 store occupies unit within the Arndale centre with an entrance on Market Street. The site is bounded by other commercial units within the Arndale Centre.

2.2. As part of the refurbishment proposals, the existing plant is to be replaced with a more efficient installation. This is understood to consist of a housed compressor pack, gas cooler, four air source heat pumps (ASHPs) and two smaller condensers. It is understood that all plant will potentially operate 24 hours per day, albeit at potentially reduced duty at night when cooling demands are lower.

2.3. The replacement equipment will be located generally in the same position as the previous installation, on the building roof.

3.0 Nearest noise sensitive receptors

3.1. The nearest residential rooms can be found in Hotel Kula at 86-88 Market Street (Receptor R1) to the south of the plant area approximately 55m away.

3.2. The windows of neighbouring commercial premises 25m to the east (Receptor R2) overlook the rooftop plant area.

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 plant area during the quietest times at which plant will operate.

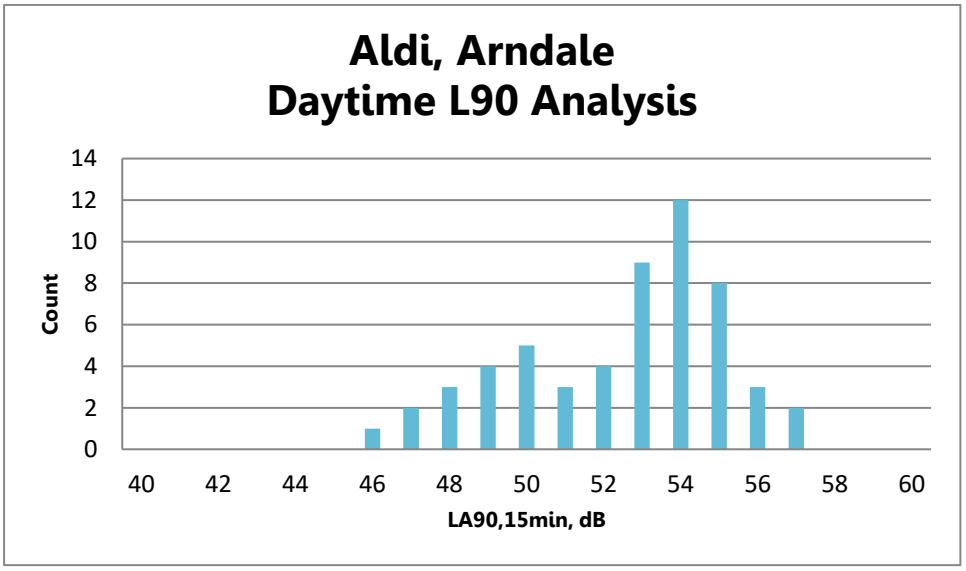
4.2. The results of the environmental sound survey are summarised in Table 1. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

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 hours)	50-72	63-94	52-67	46-57
Night-time (23.00 – 07.00 hours)	45-61	54-82	47-64	44-48

4.3. The measurement location was on Spring Gardens Road. This location is representative of the underlying noise climate at the most affected residences.

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



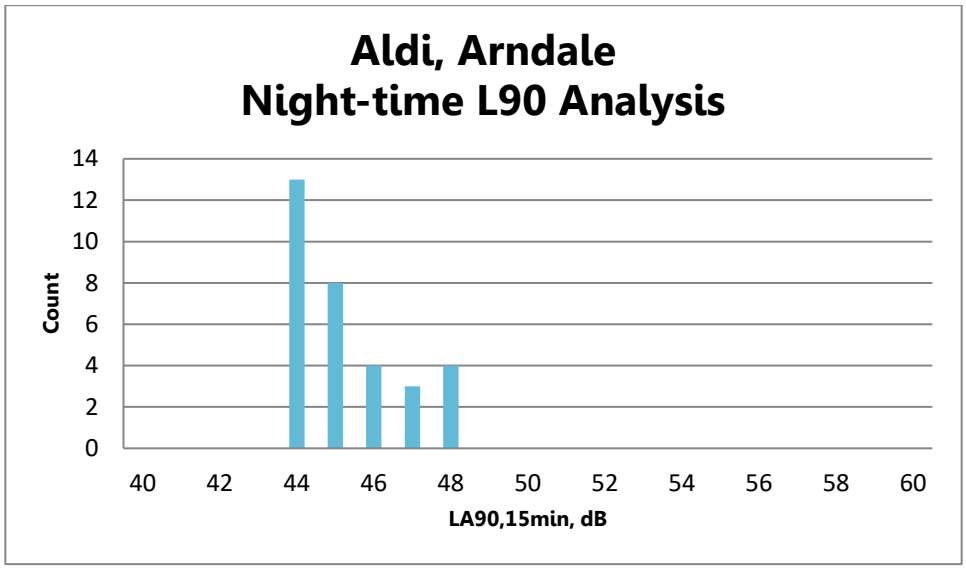
4.4. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 3 below.

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	52
Mode	54
Median	53

4.5. From the histogram analysis, 49dB 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 4 below.

Table 4 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
Mean	45
Mode	44
Median	45

4.7. From the histogram analysis, 44dB 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:

- 49dB L_{A90} during the daytime period);
- 44dB L_{A90} during the night-time period.

5.0 Noise criteria

Manchester City Council

5.1. The Planning and Noise Technical Guidance document for Manchester City Council[1] provides the following guidance with regards to noise and vibration from fixed plant/equipment.

> *The noise assessment should be based on BS 4142, and any application for fixed plant, equipment or machinery must demonstrate that:*
>
> *'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.*

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

5.2. 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[2] includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.3. 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.

5.4. 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.

5.5. 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."*

5.6. 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."*

5.7. The assessment outcome results from a comparison of the rating level with the background sound

[1] Planning and Noise, Technical Guidance, Manchester City Council, October 2022

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

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. 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.*

5.8. 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.*"

5.9. 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."*

5.10. 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."

5.11. 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.

Criterion at commercial property

5.12. Typically, local authorities do not consider office premises to be as sensitive to noise as residential properties and, therefore, emissions criteria are generally relaxed at these locations.

5.13. However, it is considered appropriate to control plant noise levels within offices to meet the recommended internal noise levels provided in BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*. The standard states a range of noise levels for various spaces used

for 'study and work requiring concentration' between 35 and 50dB L_{Aeq}.

5.14. In addition, BS 8233 provides general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states that:

> *If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB.*

5.15. This implies that should windows on a noise affected façade be openable, a sound insulation value of 15dB should be applied to the whole façade to an internal room being assessed. It should be noted that a sound insulation performance of much greater than 15dB is expected for non-openable standard double-glazed windows. However, in order to assess the worst-case scenario, this report assumes that windows may be opened if desired.

5.16. Based on the above and assuming a worst-case internal criterion of 35dB L_{Aeq}, cumulative plant noise levels at the façade of the nearest office premises should not exceed 50dB L_{Aeq}.

Summary of proposed criteria

5.17. Manchester City Council requires that the rating level of new plant, must be 5dB below the existing background sound level. The following limits therefore apply:

Table 5 Proposed plant noise emissions level limits at residences

Receptor	Period	Cumulative plant rating noise limit, dB(A)
Residential	Daytime (07.00 – 23.00 hours)	44
	Night-time (23.00 – 07.00 hours)	39
Commercial	-	50*

**Specific level*

6.0 Plant noise impact assessment

6.1. For the proposed plant installation, the cumulative sound level at the most affected noise sensitive receptors has been predicted. The assessment has taken into consideration distance attenuation and directivity corrections.

6.2. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven

and, therefore, will gently ramp up and down depending on the demands on the various systems. In order to be robust, however, a +3dB feature correction has been applied to the noise level predictions as advised in BS 4142:2014+A1:2019.

6.3. Table 6 summarises the results of the assessment at the most affected receptors. All other nearby receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix E**.

Table 6 Assessment of predicted noise levels at nearest receptor

Receptor	Period	Predicted rating level at receptor, $L_{Ar,Tr}$ (dB)	Proposed design criterion (dB)	Difference (dB)
R1, residential	Daytime (07.00 – 23.00 hours)	33	44	-11
	Night-time (23.00 – 07.00 hours)	33	39	-6
R2, commercial	Daytime (07.00 – 23.00 hours)	37*	50*	-13
	Night-time (23.00 – 07.00 hours)	37*	50*	-13

**Specific level*

6.4. The above assessment demonstrates that the proposed plant will result comply with the local authority's usual requirements.

Uncertainties

6.5. 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.

7.0 Conclusions

7.1. As part of a refurbishment programme, Noise Solutions Ltd (NSL) has been commissioned by Aldi

Stores Limited to undertake a noise impact assessment in relation to proposed replacement external plant at the Aldi Arndale store in Manchester city centre.

7.2. 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 store during representative periods.

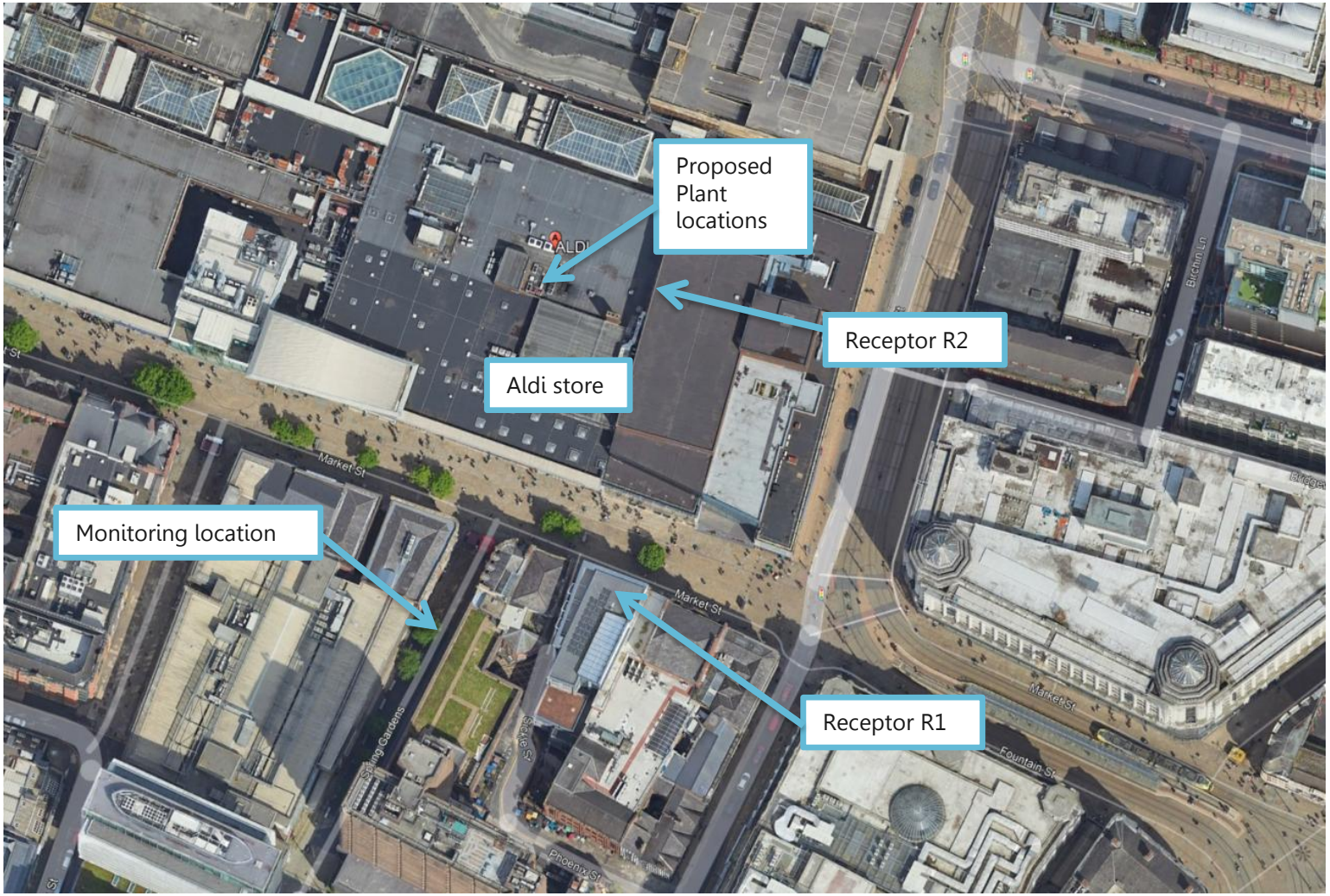
7.3. The assessment shows that proposed plant will comply with Manchester City Council's typical requirements.

7.4. Noise from the plant should not, therefore, be a reason for refusal of planning permission.

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



Appendix C Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing environmental sound levels were undertaken between 10.15 hours on Monday 23rd March and 08.15 hours on Tuesday 24th March 2026.

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 Spring Gardens (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.

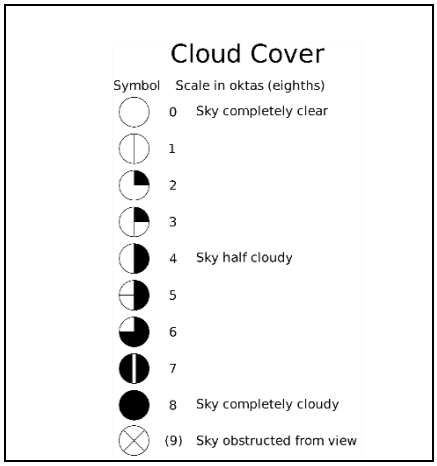
Equipment

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.
Type 1 Sound level meter	Svantek 971A / 124660	23/05/2025	1512162-1
Condenser microphone	ACO Pacific 7052E / 81197		
Preamplifier	Svantek SV18A / 130661		
Calibrator	Svantek SV33B / 125546	23/05/2025	1512162-2

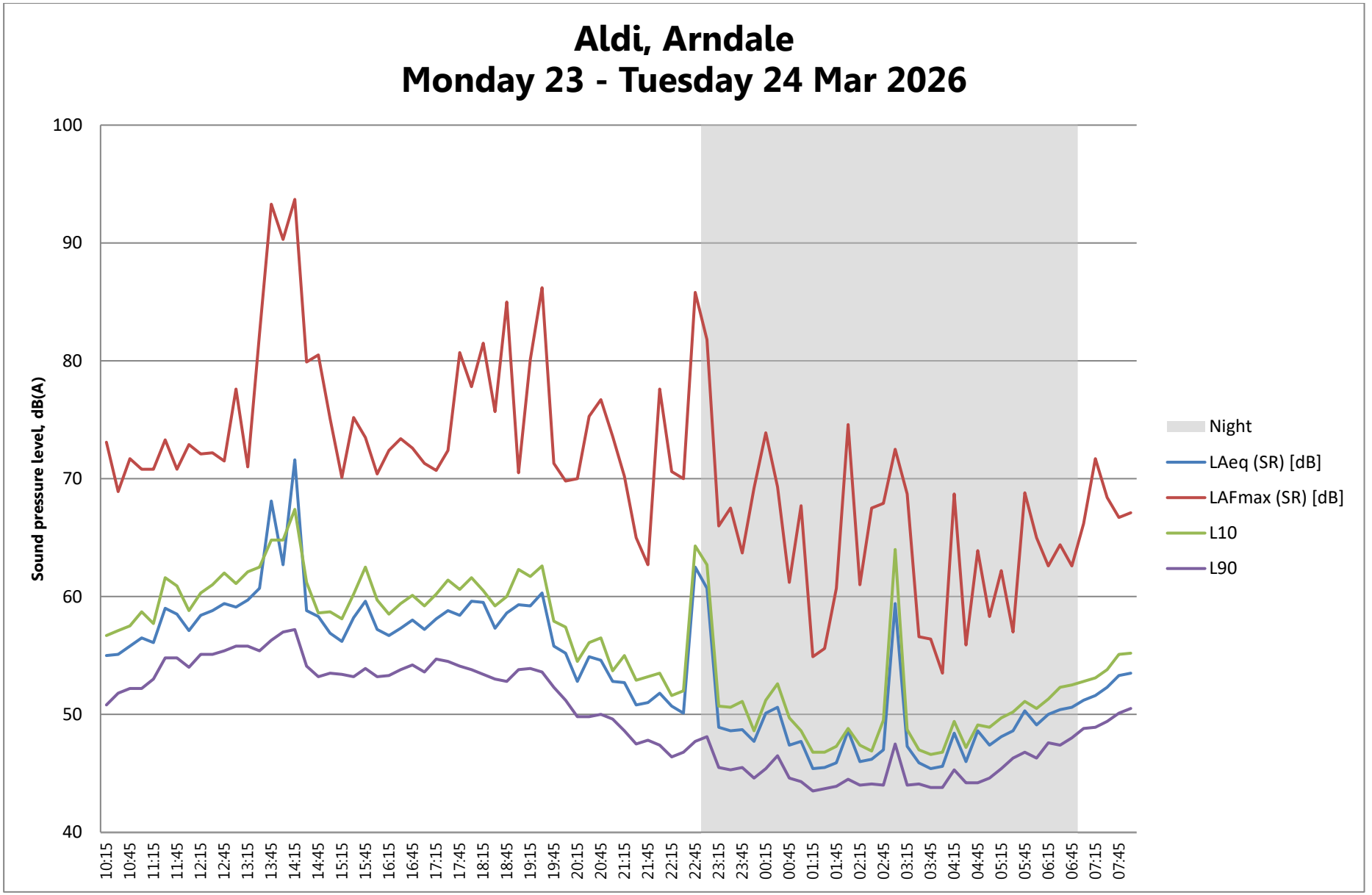
Weather conditions

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 B	10.15 23 March – 08.15 March 2026	Temperature °C	6	8
		Precipitation:	No	No
		Cloud cover (oktas – see guide)	3	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	Yes Damp
		Wind Speed (m/s)	0.6	0.6
		Wind Direction	SW	SW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	-	-

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. The noise climate during the survey period was dominated by local road traffic. The results of the survey are presented in a time history graph overleaf.


Aldi, Arndale
Monday 23 - Tuesday 24 Mar 2026
Sound pressure level, dB(A)
100
90
80
70
60
50
40
10:15
10:45
11:15
11:45
12:15
12:45
13:15
13:45
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02:45
03:15
03:45
04:15
04:45
05:15
05:45
06:15
06:45
07:15
07:45
Night
LAeq (SR) [dB]
LAFmax (SR) [dB]
L10
L90

Appendix D Proposed plant noise data

Plant Item	Make/Model	Quantity	Sound pressure level (dBA)	
			Day	Night
Refrigeration pack	Space Engineering	1	33 at 10m	33 at 10m
Refrigeration gas cooler	Space Engineering	1	30 at 10m	30 at 10m
LT condenser	Panasonic OCU-CR400VRBA-FRV-LT-20	1	36 at 10m	36 at 10m
MT condenser	Panasonic OCU-CR400VRBA-FRV-MT-32	1	33 at 10m	33 at 10m
Air source heat pumps	Arotherm	4	L_w 59 (each)	L_w 59 (each)

Appendix E Plant noise calculations

Receptor R1 Hotel Kula

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor
	dBA	at (m)						
Compressor pack	33	10	55	-15	3	0	3	24
Gas cooler	30	10	55	-15	3	0	3	21
ASHP1	59	Lw	55	-43	3	0	3	22
ASHP2	59	Lw	55	-43	3	0	3	22
ASHP3	59	Lw	55	-43	3	0	3	22
ASHP4	59	Lw	55	-43	3	0	3	22
LT condenser	36	10	55	-15	3	0	3	27
MT condenser	33	10	55	-15	3	0	3	24
Rating level (daytime and night-time – all plant running)								**33**

Receptor R2 (Commercial)

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Specific level at receptor
	dBA	at (m)						
Compressor pack	33	10	25	-8	3	0	0	28
Gas cooler	30	10	25	-8	3	0	0	25
ASHP1	59	Lw	25	-36	3	0	0	26
ASHP2	59	Lw	25	-36	3	0	0	26
ASHP3	59	Lw	25	-36	3	0	0	26
ASHP4	59	Lw	25	-36	3	0	0	26
LT condenser	36	10	25	-8	3	0	0	31
MT condenser	33	10	25	-8	3	0	0	28
Rating level (daytime and night-time – all plant running)								**37**