

The Co-operative
Rooley Moor
Rochdale
OL12 7EA

Plant Noise Impact Assessment

On behalf of



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Executive summary

Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment for new plant serving the existing Co-operative located at Rooley Moor Road, Rooley Moor, Rochdale.

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

The assessments shows that noise from the proposed plant will comply with recognised standards and guidance and should therefore be acceptable to the local authority with the installation of an acoustic screen at the rear of the store and acoustic wall lining to the plant area.

Given the results of the assessment, noise should not be ground for refusal of planning permission.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned to provide noise guidance for new plant serving the existing Co-operative store located at Rooley Moor Road, Rooley Moor, Rochdale.
- 1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.
- 1.3. Noise levels from the plant have been predicted at the nearest noise-sensitive receptors and assessed against the local authority's usual requirements and recognised standards.
- 1.4. A glossary of acoustic terminology is given in [Appendix A](#).

2.0 Details of development proposals

- 2.1. The store is located on Rooley Moor Road, Rooley Moor, Rochdale. OL12 7EA. Plant is to be located within a service area at the rear of the store.
- 2.2. The proposed plant layout is shown in [Appendix D](#).
- 2.3. The proposed plant comprises refrigeration pack, a gas cooler and two AC units.
- 2.4. The proposed refrigeration plant may potentially operate at any time of the day or night, although equipment duties will generally be lower at night when demands on the system are reduced.
- 2.5. A site plan showing the site and surrounding area, the nearest noise sensitive properties and the noise monitoring location used in this assessment is presented in [Appendix B](#)

3.0 Nearest noise sensitive receptors

- 3.1. The area surrounding the site comprises a combination of commercial and residential buildings. The nearest residential properties to the plant are the Bungalows directly behind the store to the south on Ullswater Ave (Receptor R1) approximately 10m away, the flat above the Co-op (Receptor R3) approximately 8m away and the flat above the neighbouring shop (Receptor R2) approximately 10m away.

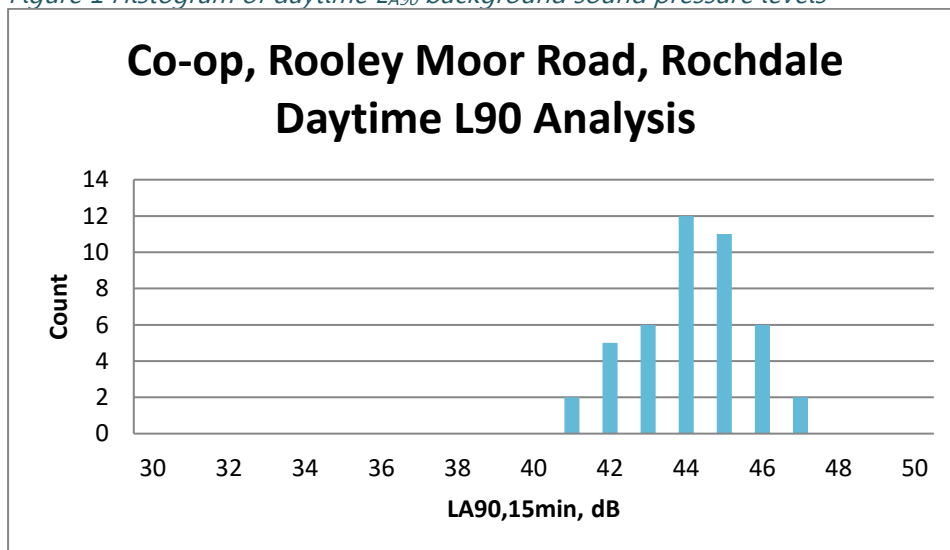
4.0 Existing noise climate

- 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 receptors to the proposed plant area during the quietest times at which the plant will operate.
- 4.2. The results of the environmental sound survey are summarised in Table 1 below. 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 (08.00 – 20.00 hours)	44-65	58-88	46-67	41-47
Night-time (20.00 – 08.00 hours)	35-50	45-74	36-49	32-43

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

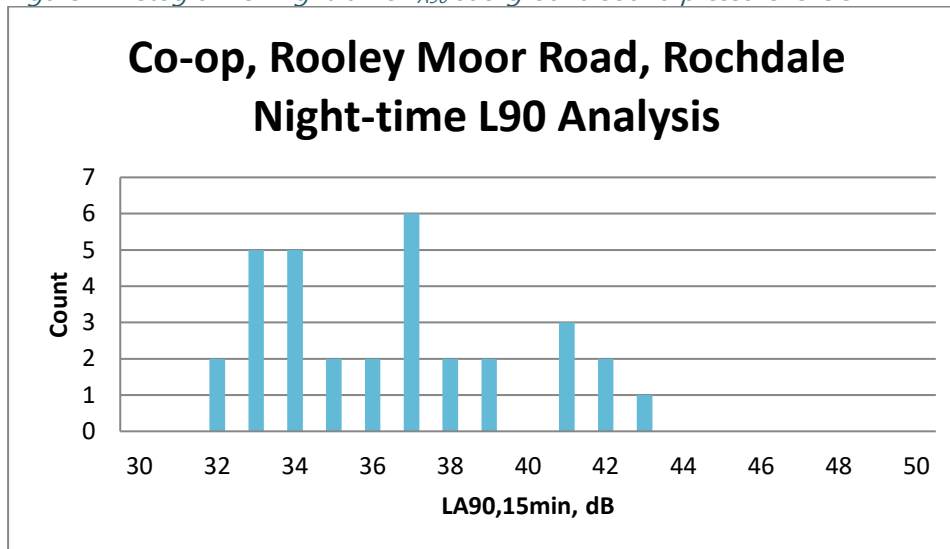


- 4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

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

dB, L_{A90} daytime period	
Mean	44
Mode	44
Median	44

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



4.4. Additional statistical analysis has been undertaken. As shown in Table 3, the mean, median, and modal values have been calculated:

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

dB, L_{A90} night-time period	
Mean	36
Mode	37
Median	36

4.5. Based on the histogram analyses above, the following values have been considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 44dB L_{A90} during the daytime period; and
- 34dB L_{A90} during the night-time period.

- 4.6. The above values have been selected to be representative of periods when road traffic on Rooley Moor Road was at a minimum and background sound levels are therefore due to more-distant noise sources also affecting the residential property closest to the plant area.

5.0 Plant noise design criteria

Rochdale Metropolitan Borough Council

- 5.1. Rochdale Metropolitan Borough Council's Unitary Development Plan 2001-2016 (which is still in place) contains policy S/7 for local shops and services, which states:

The development of, or change of use to, shops and other services of an appropriate

The development of, or change of use to, shops and other services of an appropriate scale to serve local needs will be permitted, and will be encouraged in new large scale housing and employment development, outside the existing centres (defined in Policy G/S/1 - "Hierarchy and Role of Centres") provided that:

...

d) it will not unduly affect the amenity of nearby residents or other uses by reason of noise, traffic generation and hours of opening.

- 5.2. In the absence of definitive guidance it is proposed to undertake the noise impact assessment using the method described in BS 4142:2014+A1:2019.

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

- 5.3. BS 4142:2014 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes "sound from fixed plant installations which comprise mechanical and electrical plant and equipment".
- 5.4. 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.
- 5.5. 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.
- 5.6. 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."

- 5.7. 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."*
- 5.8. 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. 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.*
- 5.9. 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."* 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.

Proposed criteria

- 5.12. It is proposed to limit noise from the new plant so that the rating level at the most-affected residential windows is no higher than the existing representative background sound level.
- 5.13. A summary of the recommended plant noise limits is given in Table 4. These limits have not been approved by the local authority at this stage.

Table 4 Proposed plant noise limits at noise sensitive residential receptors

Period	Cumulative plant noise level, dB(A)
Daytime (07.00 – 23.00 hours)	42
Night-time (23.00 – 07.00 hours)	34

6.0 Plant noise assessment

- 6.1. The plant noise levels at the nearest noise sensitive receptors have been predicted. The assessment has considered distance losses and surface acoustic reflections from the store building.
- 6.2. The calculations include a correction for an acoustic barrier between the plant and the bungalow to the rear of the store and the control of acoustic reflections by the installation of absorptive wall lining to the plant area.
- 6.3. 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 plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. The plant is also not expected to contain any significant low frequency tones, as stated in BS 4142:2014. At worst, a penalty of 3dB as described in BS 4142:2014 may be applied for the possible presence of *“...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...”*.
- 6.4.
- 6.5. Table summarises the results of the assessment at the most affected residential properties. All other nearby receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in [Appendix F](#).

Table 5 Plant noise assessment

Receptor	Period	Plant noise level at receptor, dB L_{Aeq}	Plant noise limit at receptor, dB L_{Aeq}	Excess, dB
R1 (Bungalow to the rear)	Daytime (07.00 – 23.00 hours)	36	42	-6
	Night-time (23.00 – 07.00 hours)	33	34	-1
R2 (Flat above neighbouring shop)	Daytime (07.00 – 23.00 hours)	34	42	-8
	Night-time (23.00 – 07.00 hours)	33	34	-1
R3 (Flat above Co-op)	Daytime (07.00 – 23.00 hours)	34	42	-8
	Night-time (23.00 – 07.00 hours)	33	34	-1

6.6. The assessment shows that, when attenuated as described above, noise from the plant is below the proposed criteria and would therefore be below the level at which a “low impact” would be expected, when assessed using the methodology in BS 4142:2014. The assessment demonstrates compliance with the local authority’s requirements and, therefore, the proposals should be acceptable to them in terms of noise.

Context and uncertainties

6.7. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential window. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- The assessment has been made with all plant operating at maximum capacity, as this is not always the case, the assessment is an absolute worst-case scenario.

6.8. 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.

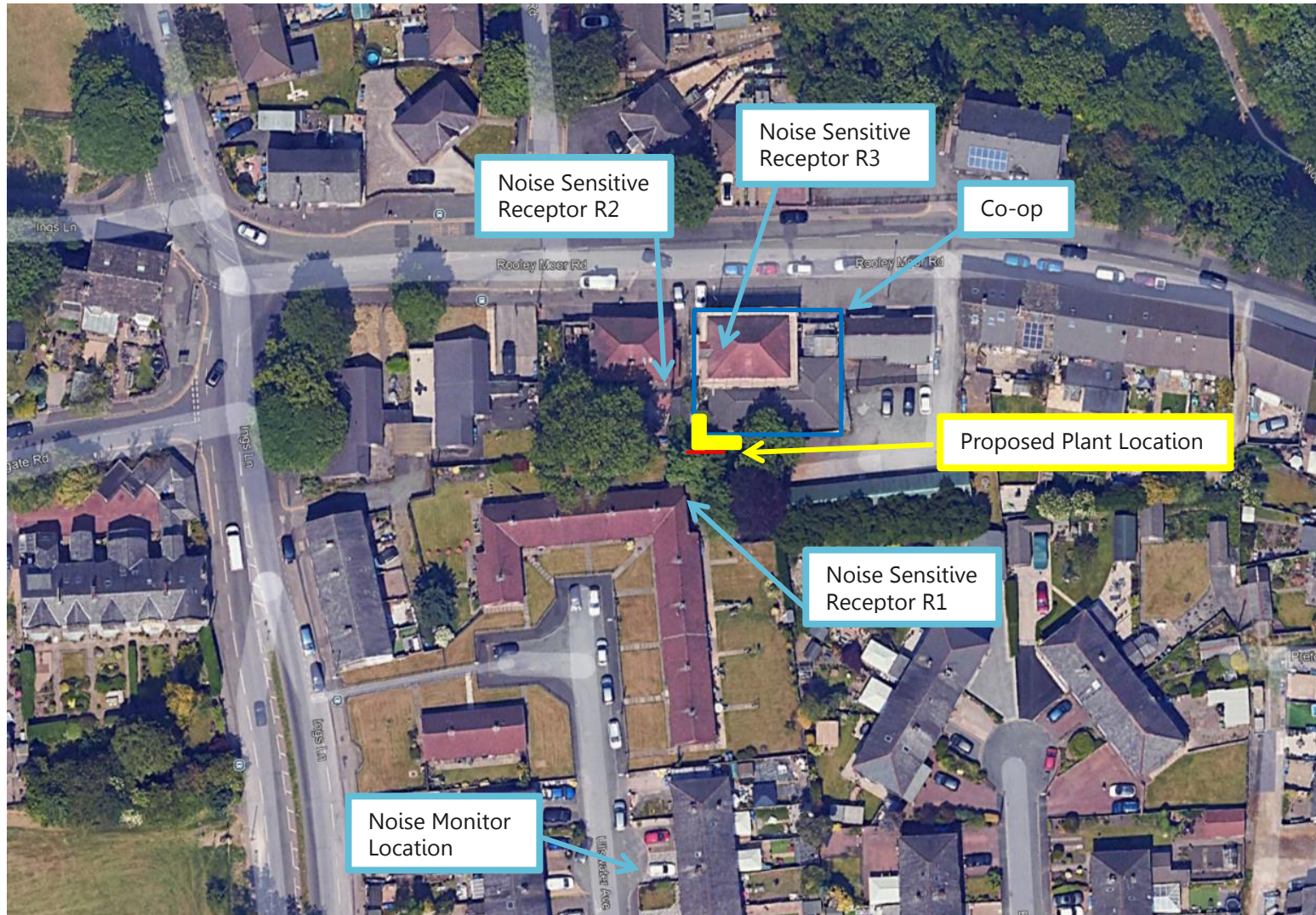
7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment for new plant serving the existing Co-operative located at Rooley Moor Road, Rooley Moor, Rochdale.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.
- 7.3. The assessments shows that noise from the proposed plant will comply with recognised standards and guidance and should therefore be acceptable to the local authority.
- 7.4. The assessment assumes the installation of an acoustic screen at the rear of the store and acoustic wall lining to the plant area.

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 s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. 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 $20\mu\text{Pa}$. 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 L_{eq} 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 that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

Appendix B Photograph of site showing areas of interest



Appendix C Environmental sound survey

Details of environmental sound survey

- C.1 Measurements of the existing background sound levels were undertaken between 16.30 hours on Wednesday 23rd October and 16.30 hours on Thursday 24th October 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 fifteen-minute sample periods for the duration of the survey.

Measurement position

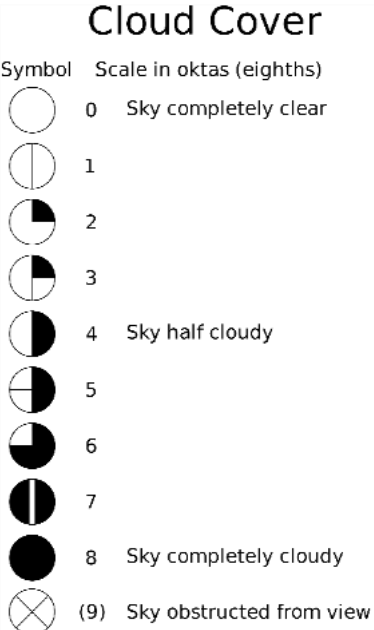
- C.3 The sound level meter was positioned on a lamppost along Ullswater Road. The approximate location of the microphone is indicated on the aerial photograph in [Appendix B](#). In accordance with BS 7445-2:1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use*', the measurements were undertaken under free-field conditions.
- C.4 The survey location was chosen such that the lowest background noise levels were similar to those at the nearest residential receptor (R1) but exclude any potential effect of noise from existing plant serving the store.

Equipment

- C.5 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 (+/-0.2 dB) in the calibration level was noted.

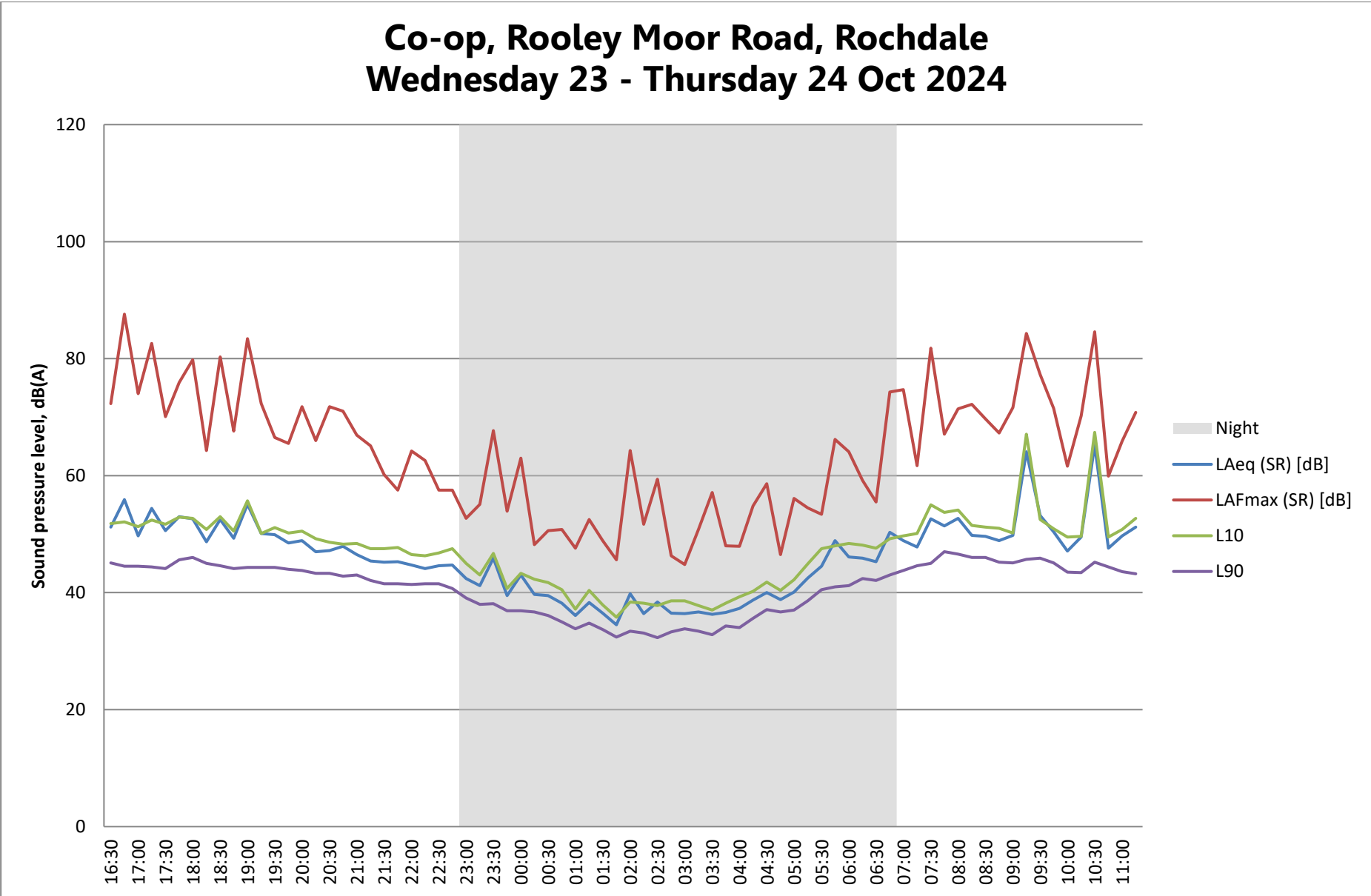
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977D / 99070	11/05/2023	Factory conformation certificate
Condenser microphone	Microtech MK255 / 25429		
Preamplifier	Svantek SV12L / 126981		
Calibrator	Rion NC-74 / 35094453	03/09/2024	1509491-1

- C.6 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.

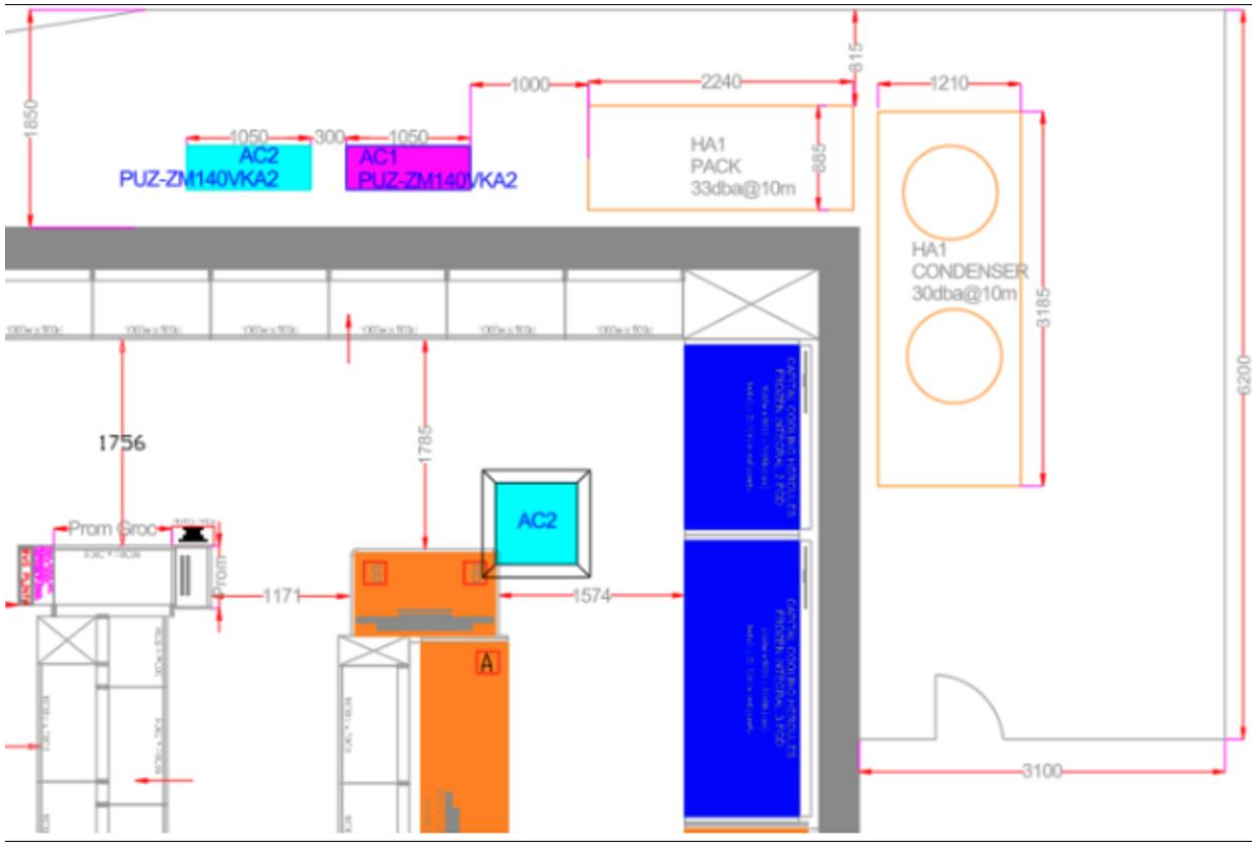
Weather Conditions				
Measurement Location	Time/Date	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	16.30 23 Oct - 11.30 24 Oct 2024	Temperature (°C)	13	14
Cloud Cover  Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas – see guide)	7	3
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	2.3	2
		Wind Direction	SSW	S
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	n/a	n/a

Results

- C.7 The results of the survey are considered to be representative of the background sound pressure levels at the façades of the most affected noise sensitive receptors to the plant area during the quietest times at which the plant will operate. The noise climate at the measurement position was dominated by distant traffic with some local traffic, aircraft and bird noise. The results of the survey are presented in a time history graph overleaf.



Appendix D Plant layout



Appendix E Plant noise data

Plant Ref		Operating Hours	Sound pressure level
Compressor Pack	HA1	Day and night	33 dBA at 10m
Gas Cooler	HA1	Day and night	30 dBA at 10m
ACU1	Mitsubishi PUZ-ZM140VKA	Day	52dBA at 1m
ACU2	Mitsubishi PUZ-ZM140VKA	Day	52dBA at 1m

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor, dB L _{A,r,T,r}
	dBA	at (m)						
Refrigeration Pack	33	10	9	1	0	-5	3	32
Gas Cooler	30	10	12	-2	0	-5	3	26
ACU1	52	1	12	-22	0	-12	3	21
ACU2	52	1	13	-22	0	-12	3	21
Rating level (daytime – all plant running)								34
Rating level (night-time – pack and gas cooler only)								33

Receptor R3 – Flat above the Co-op

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor, dB L _{Ar,Tr}
	dBA	at (m)						
Refrigeration Pack	33	10	8.5	1	0	-7	3	30
Gas Cooler	30	10	8.5	1	0	-5	3	29
ACU1	52	1	8.5	-19	0	-12	3	24
ACU2	52	1	9	-19	0	-12	3	24
Rating level (daytime – all plant running)								34
Rating level (night-time – pack and gas cooler only)								33