

SSL Manchester
Oldham Street
Manchester
M1 1AU

**Plant Noise
Guidance**

On behalf of

Sainsbury's

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Executive Summary

Noise Solutions Limited has undertaken an environmental noise survey and given guidance regarding new plant to be installed at the proposed Sainsbury's store located on Oldham Steet, Manchester M1 1AU.

It is understood that new external plant will be installed on the roof of the store.

Based on the information contained within this report, the following plant noise emission limits apply.

Guidance on maximum plant noise emission limits.

Plant	Period	Maximum plant noise emission level (L _{Aeq})
Refrigeration plant (total)	Daytime (07.00 – 23.00 hours)	45dB at 10m
	Night-time (23.00 – 07.00 hours)	42dB at 10m
Air conditioning plant (total)*	Daytime (07.00 – 23.00 hours)	65dB at 1m

**limits based on split AC units. NSL should be consulted if a VRF unit is proposed.*

It should be noted that the above limits are subject to review if final plant locations differ from the CHQ Architects Feasibility drawing (LE-A-0001).

The above limits should be achievable with a standard gas cooler and split AC units installed. If a VRF AC is proposed, it is likely that an acoustic enclosure or screen will be required. All plant and associated pipework/ductwork will need to be fitted with suitably rated spring anti-vibration mounts.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned to provide guidance on the maximum noise emissions for new plant serving a proposed Sainsbury's local store on Oldham Steet in Manchester.
- 1.2. An environmental noise 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. This report contains recommendations based on project information available at the time of the assessment and the results of a baseline noise survey. NSL can provide further guidance on receipt of the selected plant details.
- 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 www.acoustic-glossary.co.uk.

2.0 Site details

- 2.1. The Sainsbury's supermarket is to be located on the corner of Oldham Steet and Warwick Street in Manchester.
- 2.2. It is proposed there will be new air conditioning (AC) and refrigeration plant installed at the proposed store. The refrigeration plant will operate 24 hours but generally at a reduced duty at night when cooling demands are lower. The air conditioning unit will run only during daytime hours while the store is open. All external plant is to be located on the roof of the store.
- 2.3. A site plan showing the site and surrounding area is presented in [Appendix B](#).

3.0 Nearest noise sensitive receptors

- 3.1. The area surrounding the site is a mix of residential and commercial properties.
- 3.2. The most affected noise sensitive receptors will be the residential apartments (Receptor R1) overlooking the plant area from the south at a distance of around 13m.
- 3.3. The nearest noise sensitive receptors will be flats (Receptor R2) to the north east of the plant area at a distance of around 7m. Windows of these properties are completely screened from the proposed plant area by the building envelope.
- 3.4. All other receptors benefit from increased distance or are screened by the building's geometry from the plant area.

3.5. All receptors are shown in [Appendix B](#).

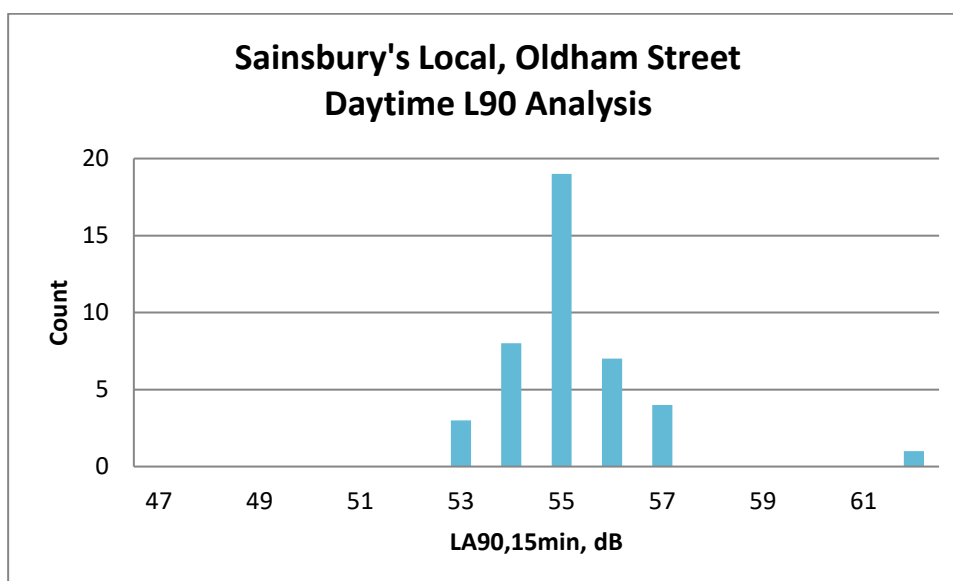
4.0 Existing noise climate

- 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 _{AFmax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (07.00 – 23.00 hours)	62-70	76-96	64-74	53-62
Night-time (23.00 – 07.00 hours)	57-69	69-89	60-73	47-56

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

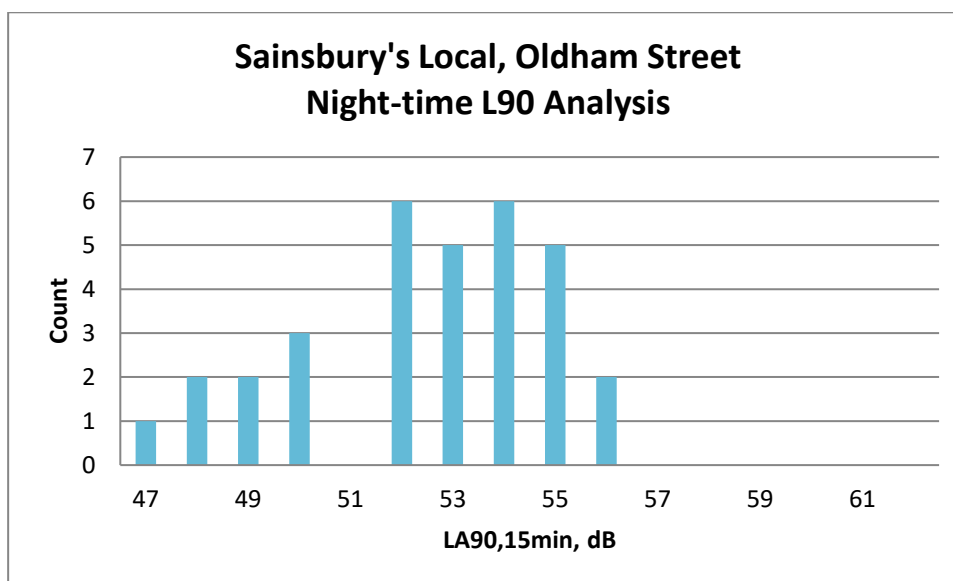


- 4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

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

dB, L _{A90} daytime period	
mean	55
modal	55
median	55

Figure 2 Histogram of night-time 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 night-time period

dB, L_{A90} night-time period	
mean	52
modal	54
median	53

- 4.5. The following values are considered robustly representative of the existing background sound pressure levels at nearby noise sensitive premises:
- 54dB L_{A90} during the daytime period; and
 - 48dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

Manchester City Council

- 5.1. The Planning and Noise Technical Guidance document for Manchester City Council¹ 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:

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

'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 (L_{Aeq}) below the typical background (L_{A90}) 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 4142:2014² 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 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;*

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

- *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.

National Planning Policy Framework

- 5.12. A new edition of the NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF³) 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.
- 5.13. 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."*
- 5.14. The NPPF goes on to state in Paragraph 191:

³ National Planning Policy Framework, DCLG, March 2012

"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 ...*

5.15. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE⁴).

5.16. 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."*

5.17. 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 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"*.

5.18. 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"*.

Summary of criteria

5.19. To comply with Manchester City Council's stipulated requirements, it is recommended that plant noise emissions should be controlled such that, at the façade of the nearest noise sensitive property the rating level should be no higher than 5dB below the prevailing background sound level.

5.20. The following cumulative plant noise limits are therefore proposed:

⁴ Noise Policy Statement for England, DEFRA, March 2010

Table 4 Proposed plant noise rating level at noise sensitive residential receptors

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	49
Night-time (23.00 – 07.00 hours)	43

5.21. It should be noted that the above criteria are below the level which would have a “low impact, depending on the context” using BS 4142:2014.

5.22. The above limits have not been approved by the local authority at this stage.

6.0 Plant noise guidance

6.1. Plant selections are to be finalised.

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 plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. However, a penalty of 3dB as described in BS 4142:2014 has been applied for the possible presence of “...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...”.

6.3. Taking account of the distance between the proposed plant and the nearest receptors, noise levels from the proposed plant should not exceed the following limits in order to demonstrate compliance with the criteria detailed above:

Table 5 Guidance on maximum plant sound emission limits

Plant	Period	Maximum plant noise emission level (L _{Aeq})
Refrigeration plant (total)	Daytime (07.00 – 23.00 hours)	45dB at 10m
	Night-time (23.00 – 07.00 hours)	42dB at 10m
Air conditioning plant (total)	Daytime (07.00 – 23.00 hours)	65dB at 1m

**limits based on split AC units. NSL should be consulted if a VRF unit is proposed.*

6.4. It should be noted that the above limits are subject to review if final plant locations differ from the CHQ Architects Feasibility drawing (LE-A-0001).

6.5. The above limits should be achievable with a standard gas cooler and split AC units installed. If a VRF AC is proposed, it is likely that an acoustic enclosure or screen will be required. All plant and associated pipework/ductwork will need to be fitted with suitably rated spring anti-vibration mounts.

Assessment of uncertainties

- 6.6. Where possible uncertainty in this assessment has been minimised by taking the following steps:
- The measurement of the background sound levels was undertaken over a period including the quietest times of the day and night.
 - The sound level meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
 - Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.
 - Care was taken to ensure that the measurement position was representative of the noise climate outside the nearby residential dwellings and not at a position where higher noise levels are present.

7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned to provide guidance on the maximum noise emissions for new plant serving a proposed Sainsbury's store located on Oldham Steet, Manchester M1 1AU.
- 7.2. Guidance has been provided with regard to permissible plant noise levels that should be acceptable to Manchester City Council.
- 7.3. The sound limits should be achievable with a standard gas cooler and split AC units installed. If a VRF AC is proposed, it is likely that an acoustic enclosure or screen will be required. All plant and associated pipework/ductwork will need to be fitted with suitably rated spring anti-vibration mounts.

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 sound surveys

- C.1 Measurements of the existing background sound levels were undertaken between 15.15 hours on Wednesday 21st February and 09.45 hours on Thursday 22nd February 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 along Oldham Street (location indicated on the site plan in [Appendix B](#)). This location is approximately representative of the levels of road traffic noise at the closest elevation of the building.
- C.4 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.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.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 97446	16/01/2023	1504305-1
Condenser microphone	Microtech MK255 / 20194		
Preamplifier	Svantek SV12L / 106487		
Calibrator	Svantek SV 30A / 10847	01/06/2023	1505421-1

Weather Conditions

- C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were generally 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	15.15 21/2/24 - 09.45 22/2/24	Temperature (°C)	10	8
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	Yes
		Cloud cover (oktas - see guide)	8	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Wet	Wet
		Wind Speed (m/s)	1	1
		Wind Direction	South westerly	South westerly
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

- C.7 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.

Sainsbury's Local, Oldham Street Wednesday 21 - Thursday 22 Feb 2024

