

Co-operative Store
South View Avenue
Caversham
RG4 5BB

**Plant Noise
Impact Assessment**

On behalf of



Project Reference: 83833| Revision: 00| Date: 4th December 2018

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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by AB Group to provide a noise impact assessment of new plant serving the Co-operative Store in Caversham.
- 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. This report contains an assessment on project information available at the time of the writing and the results of a baseline noise survey.
- 1.4. The cumulative noise level from new plant has been predicted at the nearest noise-sensitive receptor and assessed against the local authority's usual requirements and other guidance.
- 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 www.acoustic-glossary.co.uk.

2.0 Details of development proposals

- 2.1. The Co-operative store occupies a corner site between South View Avenue and Star Road with the adjacent roundabout. The store is on the ground floor with residential flats to one storey above; plant will be located externally within the small service yard facing onto Star Road.
- 2.2. New plant comprises an Air Conditioning (AC) Unit, a freezer Condenser and a Coldstore Unit. The AC plant will operate only when the store is open; refrigeration plant will run at all times, but typically at a lower duty when the store is closed, due to reduced cooling loads.

3.0 Nearest noise sensitive receptors

- 3.1. The nearest residential premises are the flats on the first floor (Receptor R1). The nearest window is approximately 10m from the plant but is screened from the plant due to building geometry.
- 3.2. An image showing the site is 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

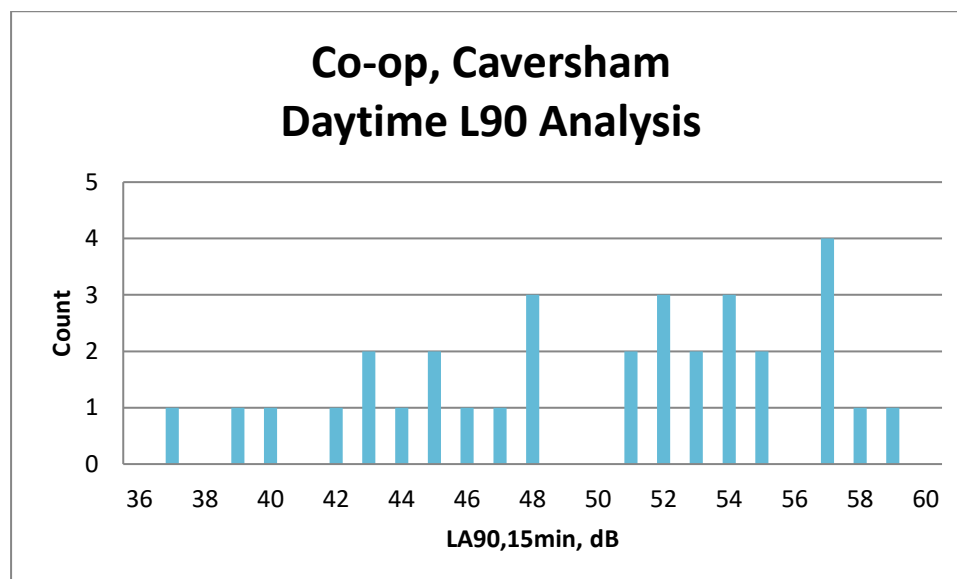
sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

- 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)	53-66	71-88	55-69	37-59
Night-time (23.00 – 07.00 hours)	38-60	57-78	37-63	29-51

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



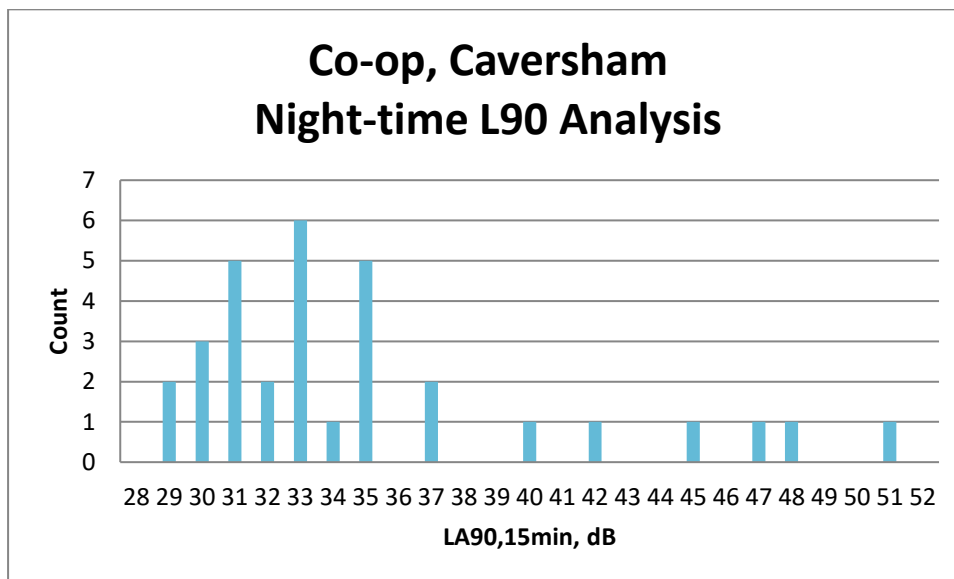
- 4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

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

dB, L _{A90} daytime period	
Mean	50
Mode	57
Median	52

- 4.4. From the histogram analysis, 45dB has been selected to be a representation of the background noise level during the daytime period.

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



- 4.5. 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	35
Mode	33
Median	33

- 4.6. From the analysis, 30dB has been chosen to be representative of the background sound level during the night-time period.
- 4.7. The following values are therefore considered representative of the existing background sound pressure levels at nearby noise sensitive premises:
- 45dB L_{A90} during the daytime period; and
 - 30dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

National Planning Policy Framework

- 5.1. A new edition of NPPF was published in July 2018 and came into effect immediately. The original National Planning Policy Framework (NPPF¹) was published in March 2012 - this

¹ National Planning Policy Framework, DCLG, March 2012

document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2018 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the July 2018 edition.

- 5.2. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing both 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 stability."*

- 5.3. The NPPF goes on to state in Paragraph 180 *"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 NPSE.
- 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 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."

Reading Borough Council

- 5.7. Reading Borough Council typically requests that noise from fixed plant should not exceed a level 5dBA below the existing background noise level, when assessed in accordance with BS 4142:2014.

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

- 5.8. 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"*.
- 5.9. 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.
- 5.10. 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.
- 5.11. 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."*
- 5.12. 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."*
- 5.13. 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.*

- 5.14. 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."*
- 5.15. 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."*
- 5.16. 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."*
- 5.17. 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.
- 5.18. Whilst the local council policy is to propose limits for noise from the new plant at 5dB below the existing background sound levels, where night time levels are already low a revised limit based on BS8233:2014 guidelines is proposed.

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

- 5.19. This Standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999²). These guideline noise levels are shown in Table 4, below:

Table 4 BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB L _{Aeq,16h}	-
Dining	Dining room/area	40 dB L _{Aeq,16h}	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq,16h}	30 dB L _{Aeq,8h}

² World Health Organisation Guidelines for Community Noise, 1999

- 5.20. The Standard notes that internal noise levels within dwellings, with windows partially open for ventilation, are typically 15dBA lower than the façade incident sound level.

Summary

- 5.21. Daytime limit is set at 5dB below the measured background.
- 5.22. Due to the already low background noise levels present at night (30dBA) it is proposed that the plant noise level at the nearest windows is controlled so that it is no higher than 35dBA, in order that internal levels due to plant noise are no higher than 20dBA. (This level is lower than noise produced by a modern household refrigerator and is 10dB below the BS 8233 and WHO guidelines for bedrooms).

Table 5 Proposed plant noise emissions level limits at noise sensitive receptors

Receptor	Period	Cumulative plant rating level, dB(A)
Nearest Receptor	Daytime (07.00 – 23.00 hours)	40
	Night-time (23.00 – 07.00 hours)	35

6.0 Plant noise impact assessment

- 6.1. Noise emission from the new proposed plant has been predicted at the nearest receptors to the site based on the noise output information shown in [Error! Reference source not found.](#)
- 6.2. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics providing it is well maintained. The proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. To be robust, however, a +3dB feature correction as advised in BS 4142:2014 has been applied for the condenser plant for the possible presence of "...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...".
- 6.3. Table 6 below, summarises the assessment of predicted noise rating levels. The full calculation is presented in [Error! Reference source not found.](#)

Table 6 Assessment of predicted noise levels at the nearest noise sensitive receptors

Location	Period	Predicted Level LAeq (dB)	Limit	Difference
R1	Daytime (07.00 – 23.00 hours)	33	40	-7
	Night-time (23:00 – 07:00 hours)	31	35	-4

- 6.4. External noise level predictions demonstrate that cumulative noise emissions from the proposed plant will result in a “low impact” according to the method in BS 4142:2014 and will also meet the proposed criteria given in Table 5 of this report. Plant noise should therefore be acceptable to Reading Borough Council.

Context and assessment of uncertainties

- 6.5. As BS 4142:2014 advises, the estimated 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 assessments are undertaken at the nearest residential windows. The impact on all other residential premises will be lower due to distance losses.
- 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 were 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.

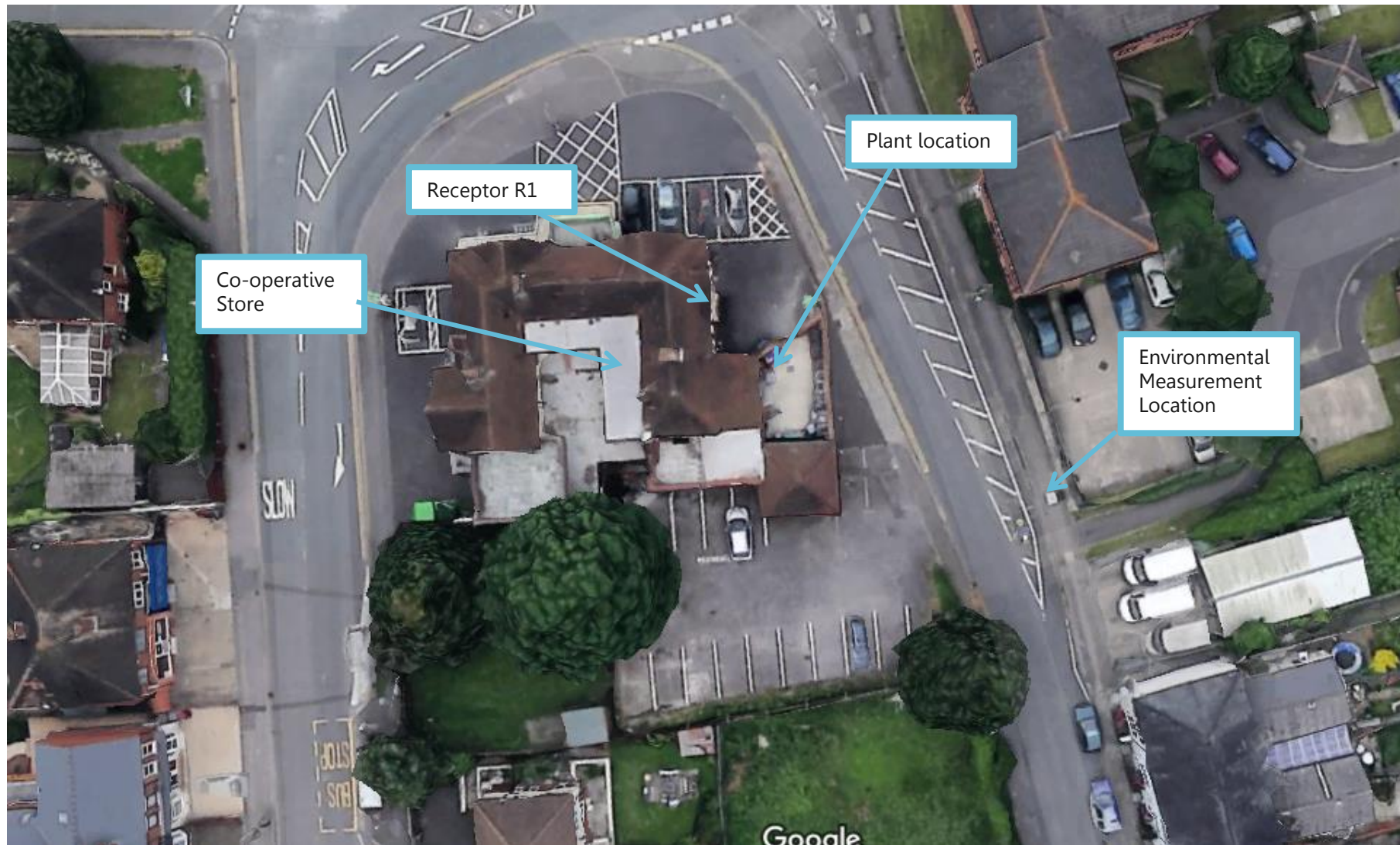
7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned by AB Group to provide a noise impact assessment for new plant serving the Co-operative Store in Caversham.
- 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 plant area.
- 7.3. The cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed against the requirements of Reading Borough Council and other guidance.
- 7.4. The results of the assessment demonstrate that cumulative noise levels at the most affected noise sensitive windows should be acceptable to the local planning authority during both the daytime and night-time periods.

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 Photographs showing areas of interest





Appendix C Environmental sound survey

Details of sound surveys

- C.1 Measurements of the existing background sound levels were undertaken from 18.30h on Monday 3rd December to 10.00h on Tuesday 4th December 2018.
- 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 sound level meter was positioned on a lamppost on Star Road (position indicated in [Appendix B](#)).
- 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.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	27/06/2018	UCRT18/1652
Condenser microphone	Rion UC-59 /08290		
Preamplifier	Rion NH-25 / 54080		
Calibrator	Rion NC-74 /34535932	09/10/2017	1657

Weather Conditions

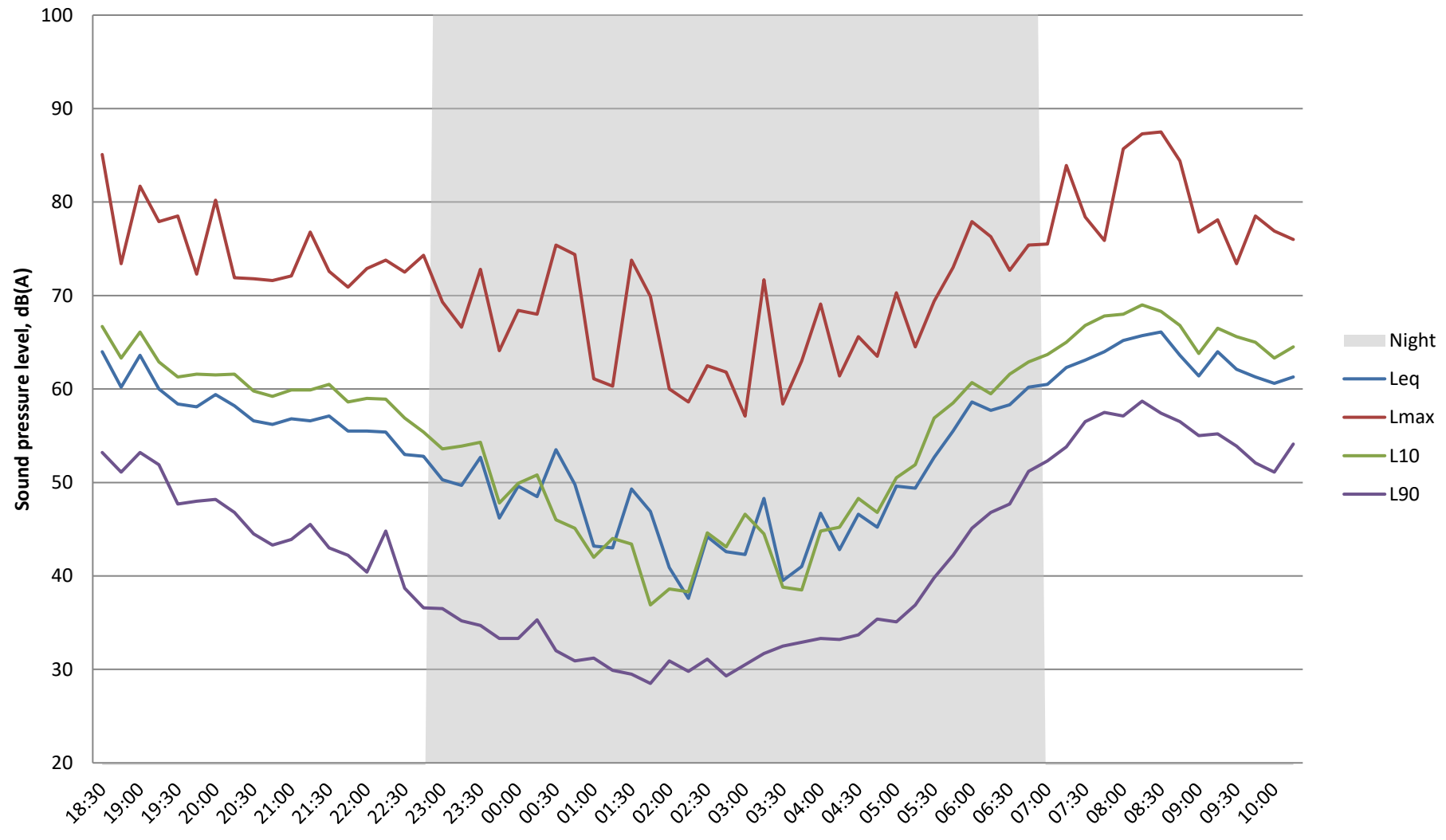
- C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	18.30 03/12/2018 – 10.00 04/12/2018	Temperature (°C)	10.0	6.0
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	2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Yes	No
		Wind Speed (m/s)	1.15	1.43
		Wind Direction	N	S
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

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 local traffic noise.
- C.8 The results of the survey are presented in a time history graph overleaf.

Co-op, Caversham Monday 03 - Tuesday 04 Dec 2018



Appendix D Manufacturers' noise data

Description	Make	Model	Quantity	Operating period	Manufacturer noise level, dBA
Coldstore Unit	Rivacold	FTM028P001	1	Daytime	43 @ 1m
				Night-time	43 @ 1m
Freezer Condenser	J&E Hall	JEHS-0400-B3-L-3	1	Daytime	35 @ 10m
				Night-time	35 @ 10m
ACU 02	Mitsubishi	MUZ-SF35VE	1	Daytime	50 @ 1m
				Night-time	—*

**AC plant only operates during store opening hours*

Appendix E Noise level predictions

Plant item	Manufacturer data		Distance correction		Directivity (dB)	Number of units	Correction (dB)	Screening (dB)	BS4142 Penalty (dB)	Resultant at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Correction (dB)						
Coldstore Unit	43	1	10	-20	3	1	0	-10	3	19
Freezer Condenser	35	10	10	0	3	1	0	-10	3	31
ACU 02	50	1	10	-20	3	1	0	-10	3	26
									Cumulative Daytime	33
Coldstore Unit	43	1	10	-20	3	1	0	-10	3	19
Freezer Condenser	35	10	10	0	3	1	0	-10	3	31
									Cumulative Night time	31