

The Co-operative

Nyetimber Lane
Aldwick
PO21 3HG

Plant Noise Impact Assessment

On behalf of

weatherhead

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For and on behalf of Noise Solutions Ltd				

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Contents

1.0	Introduction	2
2.0	Details of development proposals.....	2
3.0	Nearest noise sensitive receptors	2
4.0	Existing noise climate	3
5.0	Plant noise design criteria	5
	Arun District Council.....	5
	BS 4142:2014 Methods for rating and assessing industrial and commercial sound.....	5
	Proposed criteria	6
6.0	Plant noise assessment	7
	Uncertainties and context.....	7
7.0	Summary	8

Appendices

Appendix A	Acoustic terminology
Appendix B	Images of site showing areas of interest
Appendix C	Environmental sound survey
Appendix D	Plant layout plan
Appendix E	Plant noise data
Appendix F	Plant noise calculations

Executive summary

Noise Solutions Limited has been appointed to provide a noise impact assessment of replacement plant to be installed at the existing Co-operative store located at 2 Nyetimber Lane, Aldwick, Bognor Regis.

Replacement refrigeration plant will be installed within the service yard to the west of the store.

The assessment shows that noise from the plant will comply with the local authority's usual requirements and should therefore be acceptable to them.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Weatherhead Shop Designers to provide a noise impact assessment of replacement refrigeration plant serving the existing Co-operative store located at 2 Nyetimber Lane, Aldwick, Bognor Regis.
- 1.2. 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.
- 1.3. The noise level from the replacement plant has been predicted at the nearest noise-sensitive receptor and assessed against local and national guidance and recognised standards.
- 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 Details of development proposals

- 2.1. The Co-operative store occupies a site at the junction of Nyetimber Lane and Grosvenor Gardens, Aldwick.
- 2.2. As part of the refurbishment of the store it is proposed to install replacement refrigeration plant within the service yard at the west side of the building.
- 2.3. The replacement refrigeration plant will comprise a compressor pack and a gas cooler. This plant will run at all times.
- 2.4. The existing air conditioning (AC) units are to be retained and are therefore outside the scope of this assessment. The AC units operate only when the store is open.

3.0 Nearest noise sensitive receptors

- 3.1. The nearest residential dwelling to the plant location is the house immediately to the west, on Grosvenor Gardens. The nearest windows are approximately 5m from the plant, but are screened from it by the building layout.
- 3.2. Images showing the site and surrounding area, the nearest noise sensitive property and the noise monitoring location used in this assessment are presented in *Appendix B*.

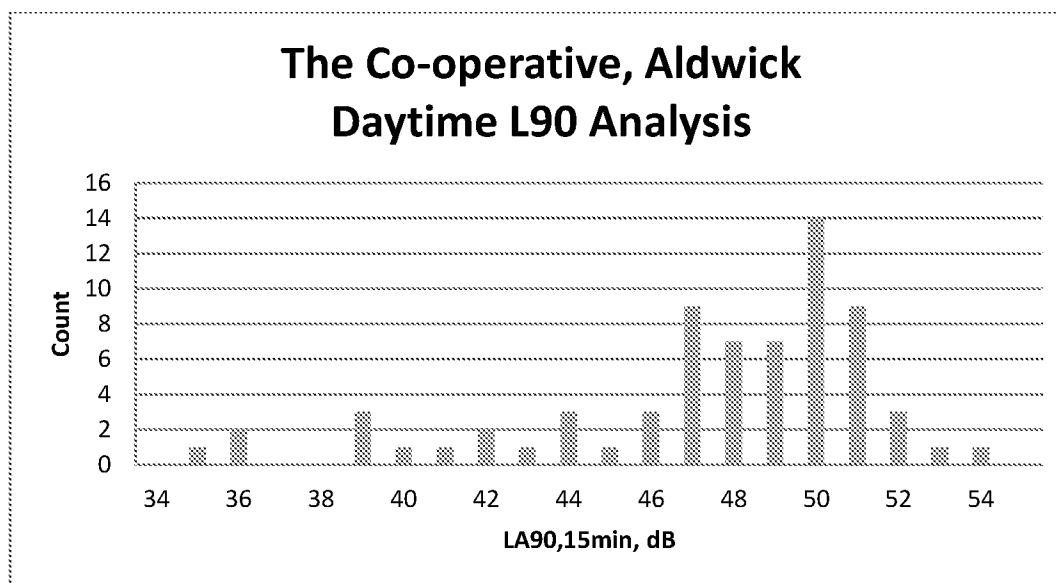
4.0 Existing noise climate

- 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)			
	$L_{Aeq(15min)}$	$L_{Amax(15min)}$	$L_{A10(15min)}$	$L_{A90(15min)}$
Daytime (07.00 – 23.00 hours)	58-74	78-104	55-73	35-54
Night-time (23.00 – 07.00 hours)	33-65	40-85	35-70	31-43

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



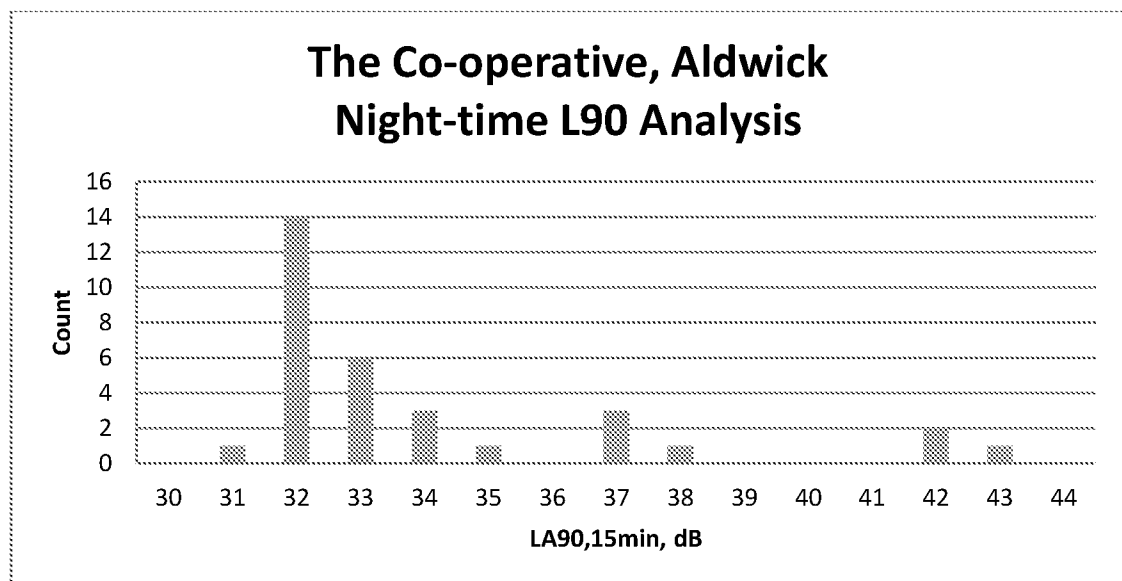
- 4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in table 2 below.

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

dB L_{A90} daytime period	
Mean	47
Mode	50
Median	49

- 4.4. From the histogram analysis, 39dB 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



- 4.5. 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	34
Mode	32
Median	33

- 4.6. Again from the histogram analysis, 32dB has been chosen to be representative of the background sound level during the night-time period.
- 4.7. Therefore, the following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:
- 39dB L_{A90} during the daytime period; and
 - 32dB L_{A90} during the night-time period

5.0 Plant noise design criteria

Arun District Council

- 5.1. The *Planning Noise Advice Document for Sussex*, which has been adopted by Arun District Council, contains the following paragraph in relation to Industrial and Commercial Noise Sources.

The starting point for designing any industrial/ commercial development should be to minimise noise "as far as reasonably practicable". The rating level of the plant/process, when measured in accordance with BS4142:2014, should, where practicable, be no greater than the existing background levels when measured in accordance with BS4142:2014. There may be instances, for specific sites, where a rating level below background is deemed appropriate. This can be determined through prior discussion with the Local Planning Authority or Local Environmental Health Department. For example, a rating level of 10 dBA below background may be required in certain instances if there are specific concerns such as the potential for noise creep. It is considered that meeting these criteria would avoid adverse noise impacts, in the interests of ensuring a good standard of amenity and protecting human health. Where these criteria are not attainable, the noise report should explain why, and how best practicable means will be implemented to control noise in order to satisfy the LPA that the development is acceptable

- 5.2. Since the proposed plant is to replace existing plant at the store, it is reasonable to assume that there is a negligible risk of noise creep and therefore meeting the normal criteria will be acceptable.

BS 4142:2014 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"*. The standard has been referenced as appropriate for the assessment of noise from plant.
- 5.4. The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains *"a tone, impulse or other characteristic"* then various corrections can be added to the specific (source) noise level to obtain the *"rating level"*. Specifically, *"Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*

5.5. The likely effects of sound on people are assessed by subtracting the background noise level from the rating level. BS 4142:2014 states the following:

- *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.*

5.6. 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.

5.7. The standard also notes 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."

Proposed criteria

5.8. In view of the advice contained in the Planning Noise Advice Document: Sussex 2015, it is considered appropriate for plant noise emissions to be controlled such that the rating level at the nearest residential windows does not exceed the existing representative background sound level. The proposed noise limits are shown in Table 4.

Table 4 Plant noise emissions limits at residences

Period	Cumulative plant rating level, dB(A)
Daytime (07.00 – 23.00 hours)	39
Night-time (23.00 – 07.00 hours)	32

5.9. Application of the above limits will result in a plant noise level at or below the level at which, according to BS 4142:2014, there is likely to be a "low impact".

6.0 Plant noise assessment

- 6.1. The plant noise level has been predicted at the nearest noise-sensitive receptor. Predictions include attenuation due to distance between the plant and the receptor.
- 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. A summary of the predicted noise levels is shown in Table 5. Full calculations are given in Appendix F.

Table 5 Plant noise assessment – external rating level

Receptor	Period	Plant rating level at receptor, dB(A)	Proposed criterion, dB(A)	Excess
R1	Daytime (07.00 – 23.00 hours)	26	39	-13
	Night-time (23.00 – 07.00 hours)	26	32	-6

- 6.4. The assessment shows that the rating noise level at the nearest residential premises complies with the proposed criteria.

Uncertainties and context

- 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.

- 6.6. 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 most affected residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- 6.7. The local authority is anticipated to require details of the proposed plant and a noise impact assessment report as part of the planning application.

7.0 Summary

- 7.1. Noise Solutions Ltd has been commissioned by Weatherhead Shop Designers to provide a noise impact assessment of replacement refrigeration plant serving the Co-operative store at 2 Nyetimber Lane, Aldwick, Bognor Regis.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at locations representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.
- 7.3. The assessment shows that noise from the replacement plant will comply with the local authority's usual requirements and should therefore be acceptable to them.

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 Images of site showing areas of interest

Aerial view

Survey location

Receptor R1



Image © Google 2019

View at front



Appendix C Environmental sound survey

Details of sound surveys

- C.1 Measurements of the existing background sound levels were undertaken between 11.00 hours on Tuesday 6th October and 12.15 hours on Wednesday 7th October 2020.
- 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 lamppost on Grosvenor Gardens (location indicated on the site plan 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

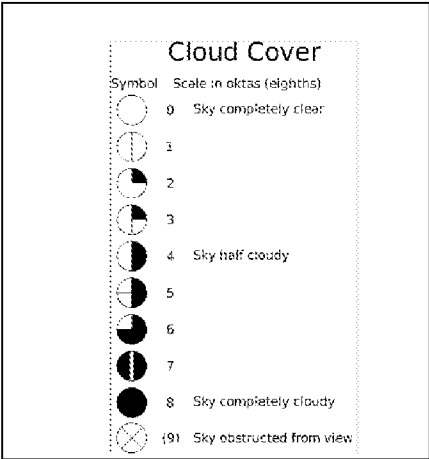
- C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (± 0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 949 / 12262	12/4/2019	TCRT19/1290
Condenser microphone	MCE212 / 42528		
Preamplifier	Svantek SV12L / 13163		
Calibrator	Svantek SV 33B / 83850	29/10/2019	14013747-02

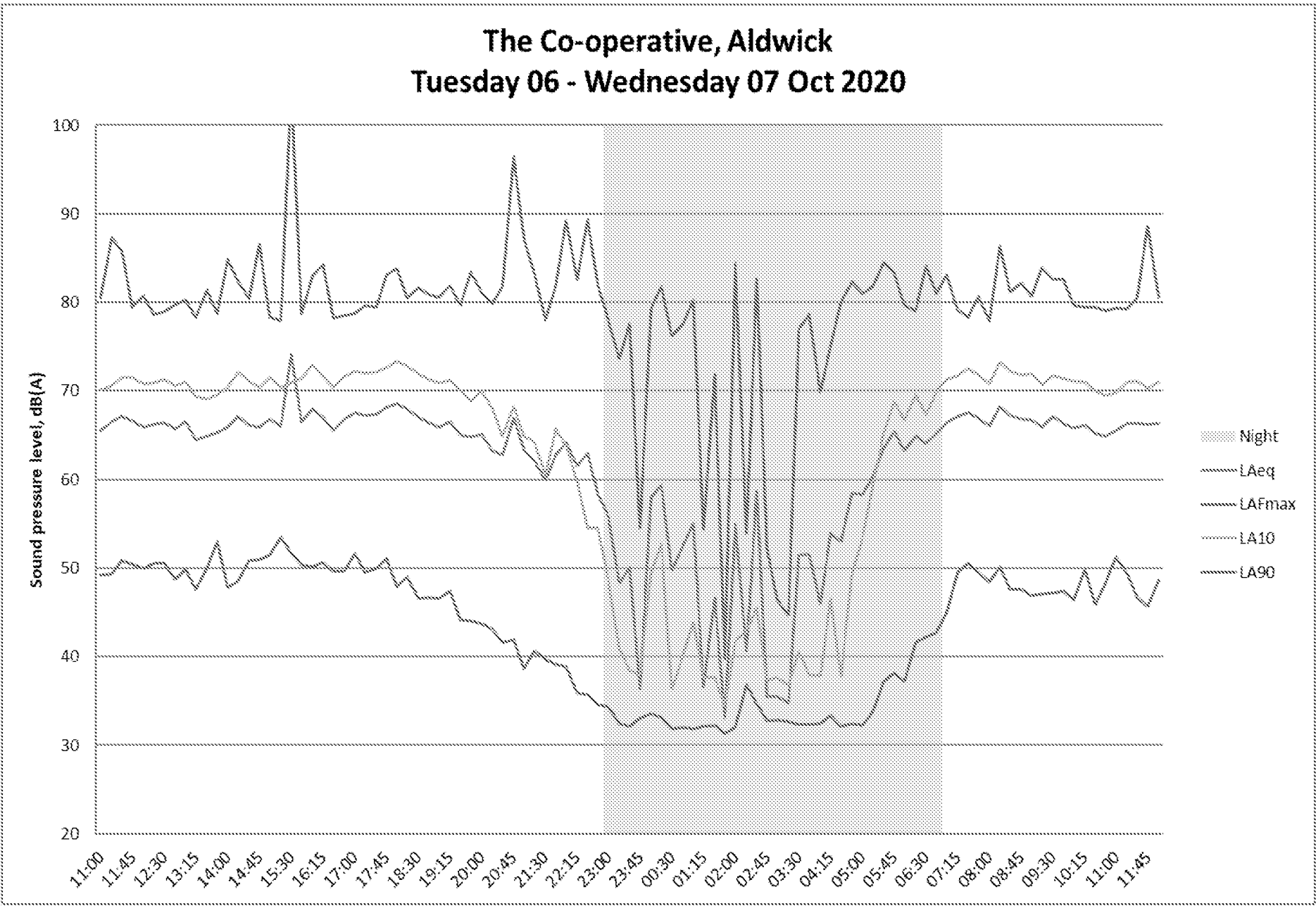
Weather conditions

- 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.

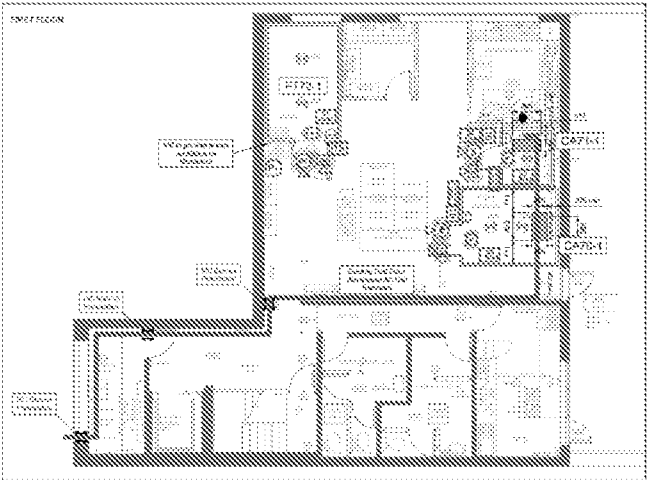
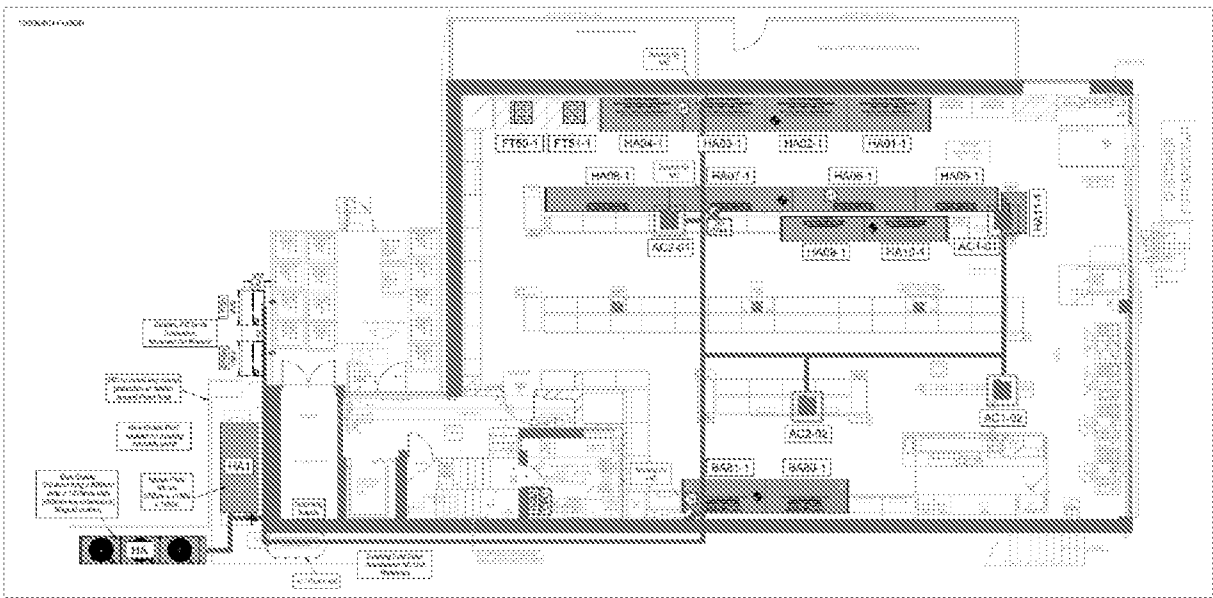
Weather conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	11.00 6 Oct - 12.15 7 Oct 2020	Temperature (°C)	13	14
 Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy 9 Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas - see guide)	3	2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Damp	No
		Wind Speed (m/s)	2	breeze
		Wind Direction	S	-
		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.



Appendix D Plant layout plan



Leak Detection System Schedule				
Device	Item ID	Manufacturer	Location	Type
101	101-1	101-1	101-1	101-1
102	102-1	102-1	102-1	102-1
103	103-1	103-1	103-1	103-1
104	104-1	104-1	104-1	104-1
105	105-1	105-1	105-1	105-1

Legend
101-1
102-1
103-1
104-1
105-1
106-1
107-1
108-1
109-1
110-1
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200-1

Appendix E Plant noise data

Plant Ref	Manufacturer / Model	Operating Hours	Sound pressure level
HA Gas Cooler	Kelvion GF-SA103F5H-063	Day and night	20dBA at 10m
HA1 Pack	Space ST3A	Day and night	20dBA at 10m

Appendix F Plant noise calculations

Plant noise to Receptor R1

Plant Item	Operating Period	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Screening (dB)	BS 4142:2014 feature correction	Cumulative plant rating level at facade L _{Aeq} (dB)
			Distance to Receptor (m)	Correction (dB)				
Gas Cooler	Day and night	20 @ 10m	5	6	0	-8	3	21
Pack	Day and night	20 @ 10m	5	6	3	-8	3	24
Total								26