

**Co-operative**  
77 Watchgate  
Lane End  
Dartford  
DA2 7JY

**Plant Noise  
Impact Assessment**

On behalf of

**Hutton**  
SHOPFITTING

Project Reference: 91866 | Revision: 00 | Date: 03<sup>rd</sup> November 2023

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## Document Information

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Revision	Date	Description	Prepared	Reviewed/ Approved

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**Contents**

**1.0 Introduction ..... 1**

**2.0 Details of development proposals..... 1**

**3.0 Nearest noise sensitive receptors ..... 1**

**4.0 Existing noise climate ..... 1**

**5.0 Plant noise design criteria ..... 4**

    National Planning Policy Framework .....4

    Dartford Borough Council .....4

    BS 4142:2014 Methods for rating and assessing industrial and commercial sound .....6

    Proposed criteria .....7

**6.0 Plant noise assessment ..... 7**

    Context and uncertainties .....8

**7.0 Summary ..... 9**

**Appendices**

Appendix A Acoustic terminology

Appendix B Photograph of site showing areas of interest

Appendix C Environmental sound survey

Appendix D Plant noise data

Appendix E Plant noise calculations

Appendix F Plant layout

## **Executive Summary**

Noise Solutions Limited has been appointed to provide a noise impact assessment for a new plant to be installed for the existing Co-operative store at 77 Watchgate in Dartford.

A new refrigeration pack and a gas cooler and two AC units will be installed externally in the service yard to the west of the store.

The assessment shows that the noise from the proposed plant will meet the local authority's typical noise requirements. Noise from fixed plant should not be grounds for refusal of planning permission.

## 1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Hutton Shopfitting to provide guidance on maximum noise emissions from proposed plant serving the Co-operative store at 77 Watchgate in Dartford.
- 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 Co-operative store occupies the ground floor of a mixed-use building located at 77 Watchgate in Dartford.
- 2.2. It is understood that the new plant is proposed to be located externally within the service area.
- 2.3. It is proposed to install 1no. gas cooler and its pack and 2no. AC units.
- 2.4. AC units will operate only during the daytime. 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.

## 3.0 Nearest noise sensitive receptors

- 3.1. The nearest residential properties to the Co-operative store are located:
  - Receiver 1 (R1)- Flat located opposite to the service yard, approximately 6 metres from the closest plant, and screened from the AC units and gas cooler by the building.
  - Receiver 2 (R2)- Flat located above the store, with windows facing the rear. All plant is screened from this receptor by the building.

## 4.0 Existing noise climate

- 4.1. An environmental noise survey was undertaken to establish the typical background sound levels

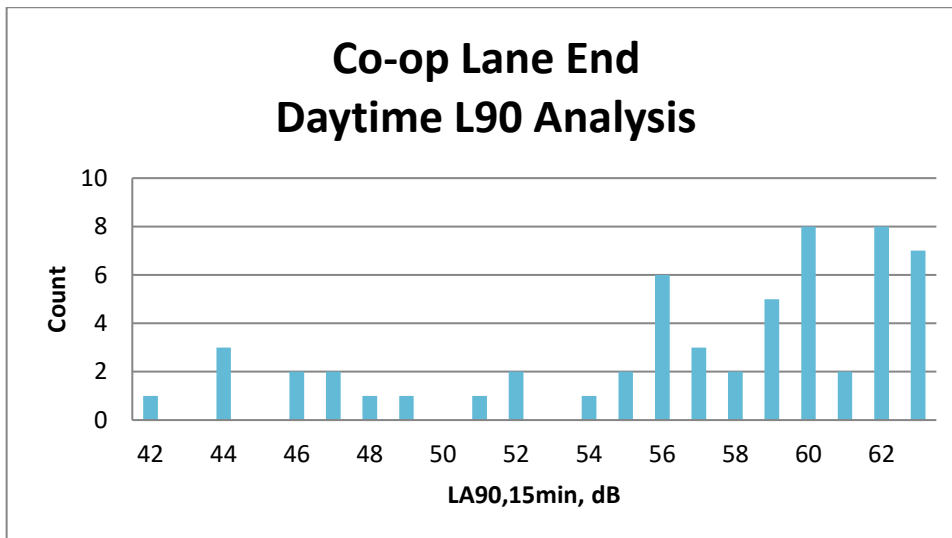
at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

- 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 <sub>Aeq</sub> (15mins)	L <sub>Amax</sub> (15mins)	L <sub>A10</sub> (15mins)	L <sub>A90</sub> (15mins)
Daytime (07.00 – 23.00 hours)	60-72	72-100	65-71	42-63
Night-time (23.00 – 07.00 hours)	51-68	70-85	53-71	44-63

*Figure Histogram of daytime L<sub>A90</sub> background sound pressure levels*



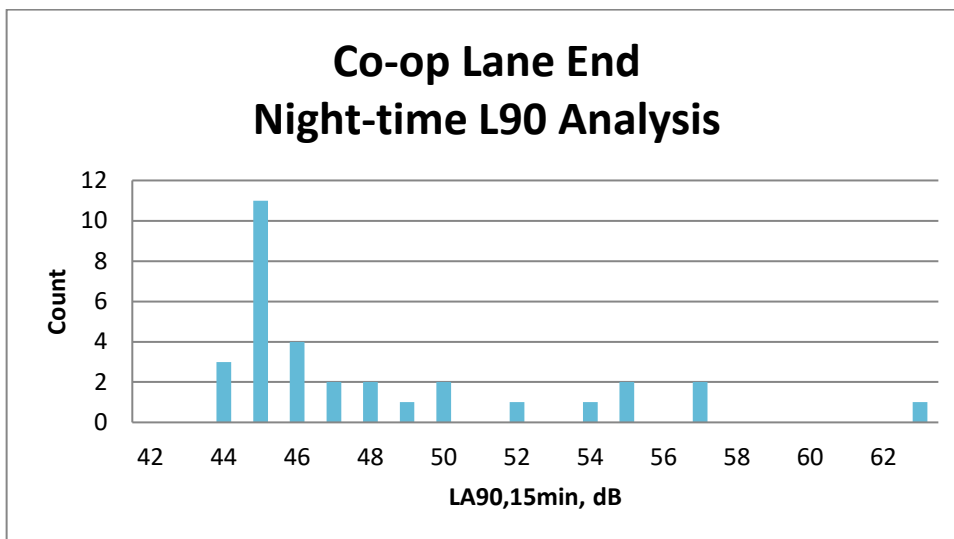
4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in table 2 below.

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

dB, $L_{A90}$ daytime period	
<b>Mean</b>	57
<b>Mode</b>	60
<b>Median</b>	59

4.4. From the histogram analysis, 48 dB has been selected to be a robust representation of the background noise level during the daytime period.

*Figure 1 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	
<b>Mean</b>	48
<b>Mode</b>	45
<b>Median</b>	46

- 4.6. Again, from the histogram analysis, 45 dB 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:
- 48dB  $L_{A90}$  during the daytime period; and
  - 45dB  $L_{A90}$  during the night-time period

## 5.0 Plant noise design criteria

### National Planning Policy Framework

- 5.1. A new edition of the NPPF was published in September 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF<sup>1</sup>) 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 2023 revised edition contains no new directions or guidance with respect to noise. The paragraph references quoted below relate to the September 2023 edition.
- 5.2. Paragraph 174 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."*
- 5.3. The NPPF goes on to state in Paragraph 185:
- "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 Noise Policy Statement for England (NPSE<sup>2</sup>).

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<sup>1</sup> National Planning Policy Framework, DCLG, March 2012

<sup>2</sup> Noise Policy Statement for England, DEFRA, March 2010



- 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”.*
- 5.7. Paragraph 119 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”.*

### **Dartford Borough Council**

- 5.8. Dartford Borough Council’s outline planning permission for the development as a whole (DA/05/00308/OUT, dated 31<sup>st</sup> March 2014) does not contain any criteria for noise from new plant.
- 5.9. Dartford Borough Council’s adopted local plan contains the following relevant policies:
- “H12 Proposals which are incompatible with the residential function of existing housing areas or which adversely affect their amenity or which are otherwise unneighbourly in planning terms, will not be permitted.”*
- And
- “B1 The following factors will be taken into account in considering development proposals: (a) Proposed Use The nature and characteristics of the proposed use should be appropriate for its location and should not have a detrimental effect on the local area through visual impact, traffic generation, noise, fumes or other factors....(d) Amenity Development proposals should not materially detract from the amenity of adjoining properties and, particularly in the case of residential properties, should avoid giving rise to the loss of daylight or sunlight. Habitable rooms should not be sited such that they overlook existing properties, nor themselves be so sited.”*
- 5.10. It is therefore considered appropriate to limit plant noise such that it has, at worst, a “low impact”, when assessed using the methodology in BS 4142:2014.

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

- 5.11. 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”*.
- 5.12. 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.
- 5.13. 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.
- 5.14. 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.”*
- 5.15. 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.”*
- 5.16. 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.*

- 5.17. 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."*
- 5.18. 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."*
- 5.19. 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."*
- 5.20. 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

- 5.21. It is proposed that, to result in a "low impact" according to BS 4142:2014, the cumulative rating noise level of the new plant at the nearest noise-sensitive receptor, is no higher than the pre-existing background sound level.
- 5.22. The cumulative noise level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in the table below:

*Table 4 Plant noise emissions limits at sensitive receptors*

Period	Cumulative plant noise level, dB(A)
Daytime (07.00 – 23.00 hours)	48
Night-time (23.00 – 07.00 hours)	45

## 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. 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..."*.
- 6.3. Table 5 summarises the results of the assessment at the most affected residential properties. The full set of calculations can be found in [Appendix E](#).

*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	Daytime (07.00 – 23.00 hours)	39	48	-9
	Night-time (23.00 – 07.00 hours)	30	45	-15
R2	Daytime (07.00 – 23.00 hours)	38	48	-10
	Night-time (23.00 – 07.00 hours)	26	45	-19

- 6.4. The assessment demonstrates that the proposed emissions criteria will be met.

### Context and uncertainties

- 6.5. 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 windows. 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 design capacity, the assessment is an absolute worst-case scenario.
- 6.6. 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**

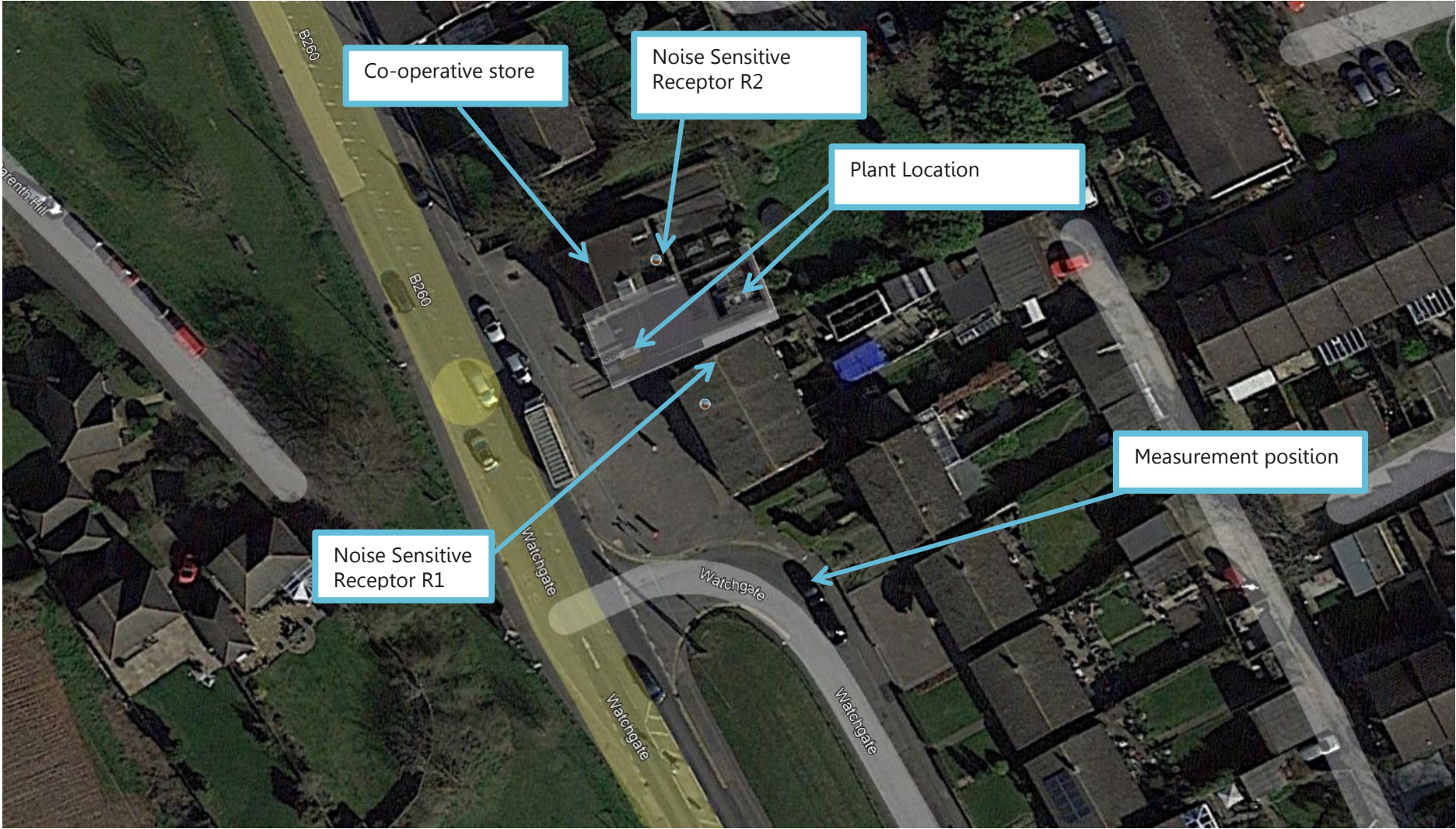
- 7.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment on a new plant serving the existing Co-operative Food store at 77 Watchgate in Dartford.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.
- 7.3. The assessment shows that noise from the proposed plant will comply with recognised Standards and guidance and should therefore be acceptable to the local authority.

## 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 12.30 hours on Monday 2nd October and 10.45 hours on Tuesday 3rd October 2023.
- 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 representative measurement position was located on a lamppost on Watchgate 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.































### 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 ( $\pm 0.2$  dB) in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977 / 36190	20/04/2023	1505154-2
Condenser microphone	ACO Pacific 7052E / 74975		
Preamplifier	Svantek SV12L / 10325		
Calibrator	Svantek SV33A / 73430	28/06/2022	1502822-1

- 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.

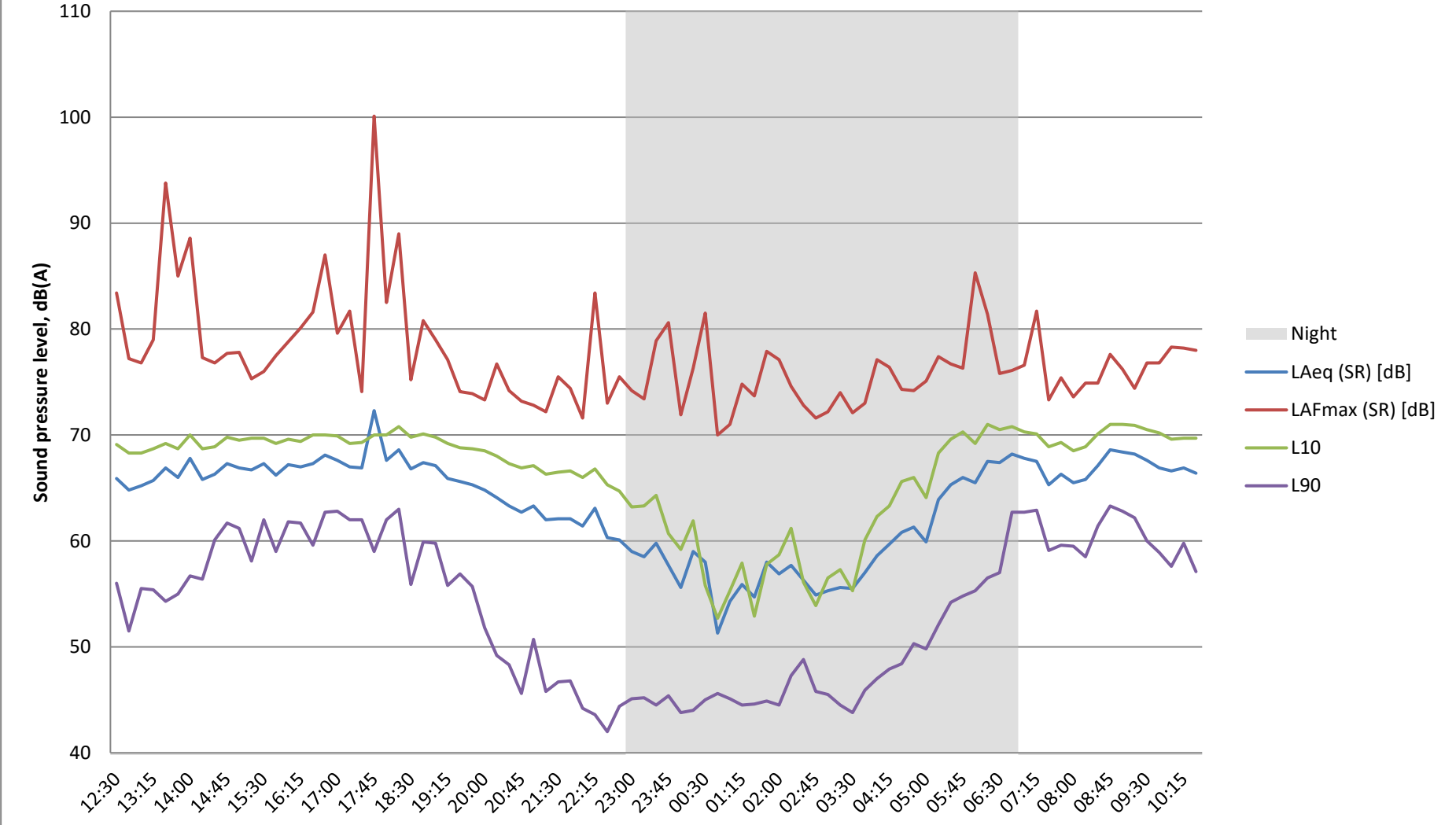


Weather Conditions																										
Measurement Location	Time/Date	Description	Beginning of Survey	End of Survey																						
As indicated on Appendix B	12.30 02 Oct 23- 10.45 03 Oct 23	Temperature	19	14																						
<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>Cloud Cover</b></p> <table border="0"> <tr> <td>Symbol</td> <td>Scale in oktas (eighths)</td> </tr> <tr> <td></td> <td>0 Sky completely clear</td> </tr> <tr> <td></td> <td>1</td> </tr> <tr> <td></td> <td>2</td> </tr> <tr> <td></td> <td>3</td> </tr> <tr> <td></td> <td>4 Sky half cloudy</td> </tr> <tr> <td></td> <td>5</td> </tr> <tr> <td></td> <td>6</td> </tr> <tr> <td></td> <td>7</td> </tr> <tr> <td></td> <td>8 Sky completely cloudy</td> </tr> <tr> <td></td> <td>(9) Sky obstructed from view</td> </tr> </table> </div>		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
		Symbol	Scale in oktas (eighths)																							
			0 Sky completely clear																							
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			5																							
			6																							
	7																									
	8 Sky completely cloudy																									
	(9) Sky obstructed from view																									
Cloud cover (oktas - see guide)	6	4																								
Presence of fog/snow/ice	No	No																								
Presence of damp roads/wet ground	yes	yes																								
Wind Speed (m/s)	2	3																								
Wind Direction	NW	NE																								
Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No																								

## Results

- C.6 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 during the survey period was dominated by local traffic. Aircraft, pedestrians, and wind were also intermittently audible. The results of the survey are presented in a time history graph overleaf.

### Co-op Lane End Monday 02 - Tuesday 03 Oct 2023



## Appendix D Plant noise data

Plant Ref	Manufacturer and Model	Operating Hours	Sound pressure level
DA Gas Cooler	Kelvion GF-SA102V6H-063S033	Daytime (07.00 – 23.00 hours)	20dB @ 10m
		Night-time (23.00 – 07.00 hours)	20dB @ 10m
DA Pack	Hubbard ST-2A/1K	Daytime (07.00 – 23.00 hours)	20dB @ 10m
		Night-time (23.00 – 07.00 hours)	20dB @ 10m
ACU-1-2	Mitsubishi PUZ-ZM140YKA	Daytime (07.00 – 23.00 hours)	52dB @ 1m
		Night-time (23.00 – 07.00 hours)	-

## Appendix E Plant noise calculations

### Receptor R1 – Façade of the house opposite to plant area- Daytime

Plant item	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Screening (dB)	BS 4142 feature correction (dB)	Plant rating level at receptor L <sub>Aeq</sub> (dB)
		Distance to Receptor (m)	Correction (dB)				
<b>ACU-1</b>	52 at 1m	8	-18	3	-5	3	35
<b>ACU-2</b>	52 at 1m	8	-18	3	-5	3	35
<b>Gas Cooler</b>	20 at 10m	6	4	3	-5	3	25
<b>Pack</b>	20 at 10m	8	2	3	0	3	28
<b>Total plant rating level, daytime</b>							<b>39</b>

### Receptor R1 – Façade of the house opposite to plant area—Night-time

Plant item	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Screening (dB)	BS 4142 feature correction (dB)	Plant rating level at receptor L <sub>Aeq</sub> (dB)
		Distance to Receptor (m)	Correction (dB)				
<b>Gas Cooler</b>	20 at 10m	6	4	3	-5	3	25
<b>Pack</b>	20 at 10m	8	2	3	0	3	28
<b>Total plant rating level, night-time</b>							<b>30</b>

### Receptor R2 – Façade of the house above the Co-operative- Daytime

Plant item	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Screening (dB)	BS 4142 feature correction (dB)	Plant rating level at receptor L <sub>Aeq</sub> (dB)
		Distance to Receptor (m)	Correction (dB)				
<b>ACU-1</b>	52 at 1m	8	-18	3	-5	3	35
<b>ACU-2</b>	52 at 1m	9	-19	3	-5	3	34
<b>Gas Cooler</b>	20 at 10m	9	1	3	-5	3	22
<b>Pack</b>	20 at 10m	7	3	3	-5	3	24
<b>Total plant rating level, daytime</b>							<b>38</b>

### Receptor R2 – Façade of the house above the Co-operative - Night-time

Plant item	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Screening (dB)	BS 4142 feature correction (dB)	Plant rating level at receptor L <sub>Aeq</sub> (dB)
		Distance to Receptor (m)	Correction (dB)				
<b>Gas Cooler</b>	20 at 10m	9	1	3	-5	3	27
<b>Pack</b>	20 at 10m	7	3	3	-5	3	24
<b>Total plant rating level, night-time</b>							<b>26</b>

