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Plant Noise Impact Assessment Report

On behalf of

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Document Information

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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

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Appendices

Executive Summary

Noise Solutions Limited has undertaken a plant noise impact assessment to assess new plant serving the Co-operative Funeralcare on Uxbridge Road, Hayes.

To control noise from the new plant to meet local authority requirements, attenuation will be required as outlined below and described within this report:

- Both extract and supply systems to be fitted with suitable attenuators.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Co-operative to undertake a noise assessment for new ventilation plant serving the Co-op Funeralcare at Uxbridge Rd in Hayes.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. Cumulative plant noise emissions for the proposed plant have been predicted at the nearest noise-sensitive receptors and assessed against the requirements of the local authority.

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-op Funeralcare occupies the ground floor unit of 940-942 Uxbridge Rd. New ventilation plant is proposed to be installed to replace the existing plant on site. The plant will comprise of two centrifugal extract fans for the supply intake (SF) and the extract (EF) systems. All the ventilation fans will be located internally.

2.2. The supply intake is located at the flat roof on the first-floor level on the roof of the building. The extract fans duct terminates vertically at the first-floor level to rear of the building.

2.3. The proposed extract and supply intake systems may operate between 07.00 and 23.00 hours daily whilst the Funeralcare office is open and will be switched off outside these hours.

2.4. The site layout plans, and locations of the proposed plant are shown in **Appendix C**. Noise data for the proposed plant is presented in **Appendix E**.

3.0 Nearest noise-sensitive receptors

3.1. The surrounding area is a mix of commercial and residential in use.

3.2. The nearest and potentially most affected receptor will be the residential flats (Receptor R1) above the Funeralcare premises. Windows of Receptor R1 are approximately 9m from the supply intake and extract fan termination.

3.3. An aerial photograph showing the site and surrounding area is provided in **Appendix B**.

4.0 Existing noise climate

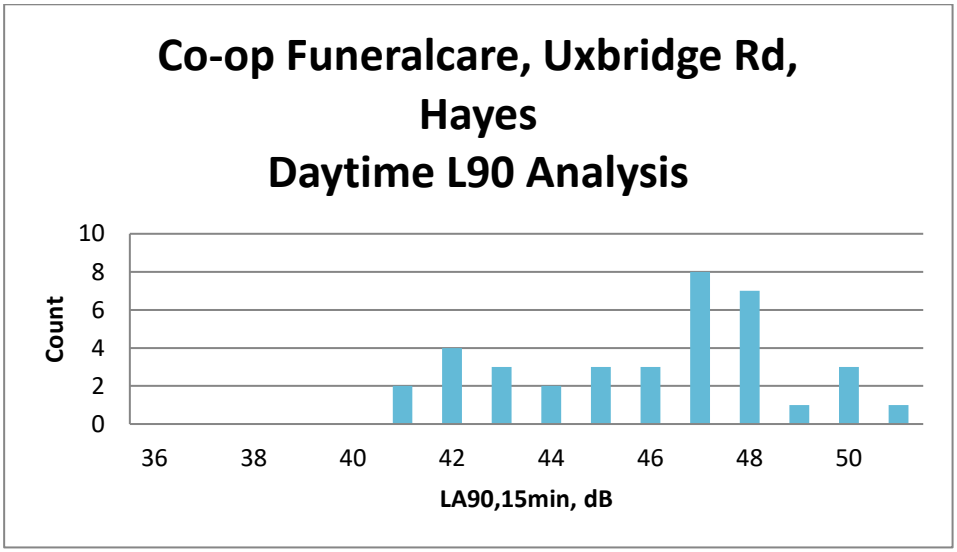
4.1. An environmental noise survey was undertaken to establish the typical background sound levels. Measurements were made at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant during the quietest times at which the plant will operate.

4.2. The results of the survey are summarised below. The full set of measurement results and details of the survey methodology are presented in **Appendix D**.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	53-68	69-96	55-67	41-51
Night-time (23.00 – 07.00 hours)	42-58	59-79	44-61	36-48

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



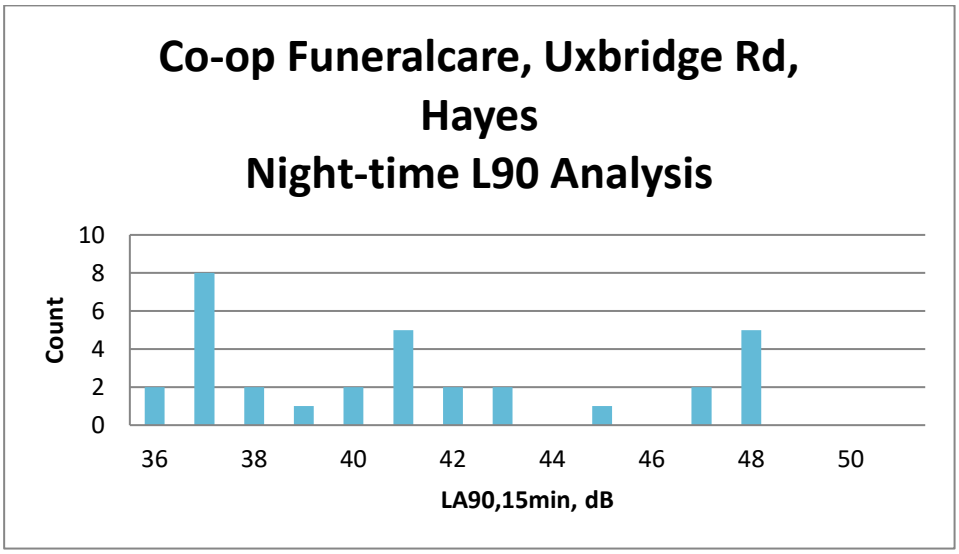
4.3. Further statistical analysis has been carried out on the data, and the mean, mode and median values are shown in Table 2 below.

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

dB, L_{A90} daytime period	
mean	46
modal	47
median	47

4.4. In order to be robust, the recorded value of 42dB has been selected to be representative of the background sound level in this area during operational hours.

Figure 2 Histogram of non-operating hours L_{A90} background sound pressure levels



4.5. Further statistical analysis has been carried out on the data and the mean, mode 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	41
modal	37
median	41

4.6. In order to be robust, the recorded value of 37dB has been selected to be representative of the background sound level in this area during operational hours.

4.7. Therefore, the following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 42dB L_{A90} during the daytime period; and
- 37dB L_{A90} during the night-time period.

5.0 Noise assessment criteria

London Borough of Hillingdon

5.1. The London Boroughs of Hillingdon, Hounslow and Richmond Upon Thames adopted a Supplementary Planning Document relating to noise generating development in July 2014. Section 6.0 of the document states:

> *The Boroughs recognise the contribution of industrial and commercial developments in helping to achieve wider sustainable development goals. However, there are many kinds of industrial and commercial developments that have the potential to generate noise. In*

the Boroughs some of the most commonly occurring noise issues with commercial developments are associated with building services plant, usually air-conditioning equipment or kitchen extraction systems. In addition to plant noise, noise associated with deliveries or collections and an increase in traffic noise levels may also impact on local residents.

5.2. For industrial and commercial development, the following criteria are to be applied:

Figure 3. Table 2 in Supplementary Planning Document

Table 2: New Industrial and Commercial Development - External Noise Standards

Noise Impact From Relevant Proposed Industrial Or Commercial Premises Or Plant	Development Outcome
Rating Level (LAr,Tr) is at least 5 dB(A) below the Background Level LA90	Normally acceptable
Rating level (LAr,Tr) is no more than 5 dB(A) above the Background Level LA90	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating level (LAr,Tr) is more than 5 dB(A) above the Background Level LA90	Normally unacceptable

Note: All terms as defined in BS4142

National Planning Policy Framework

5.3. A new edition of NPPF was published in July 2021 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with revisions in July 2018 and February 2019 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2021 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 2021 edition.

5.4. Paragraph 174 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."*

5.5. 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;

[1] National Planning Policy Framework, DCLG, March 2012

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 ...

5.6. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.7. 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."*

5.8. 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"*.

5.9. 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"*.

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

5.10. 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"*.

5.11. 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.

5.12. 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.

[2] Noise Policy Statement for England, DEFRA, March 2010

5.13. 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."*

5.14. 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."*

5.15. 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.*

5.16. 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."*

5.17. 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."*

5.18. 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."

5.19. 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.

Summary of criteria

5.20. Based on London Borough of Hillingdon's typical requirements, it is considered appropriate that the cumulative plant noise rating level of proposed plant should be controlled to a level that does not exceed 5dB below the representative L_{A90} background sound level at the nearest residential property. Noise from the new plant should therefore not exceed the limits shown in the table below:

Table 4 Plant noise emissions limits at receptor

Receptor	Period	Cumulative plant rating level, dB(A)
R1 (Residential)	Daytime (07.00 – 23.00 hours)	37
	Night-time (23.00 – 07.00 hours)	32

6.0 Plant noise impact assessment

6.1. Cumulative noise emissions from the new proposed plant have been predicted at the nearest residential properties to the site based on the noise output information shown in **Appendix E**.

6.2. Noise levels for the proposed fans have been predicted taking into account ductwork system losses, aperture size, directivity of sound propagation, screening and distance attenuation. Predictions are inclusive of atmospheric-side attenuation fitted to the ventilation systems as detailed in Table 5.

Table 5: Proposed atmospheric side attenuators to ventilation systems

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
SF (Intake)	6	12	24	38	45	42	38	29
EF (Extract)	6	12	24	38	45	42	38	29

6.3. The predictions during operating hours have been based on the proposed plant operating simultaneously at full capacity. It has been assumed that all plant items will operate only during the hours when the Funeralcare is open.

6.4. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics providing it is well maintained. All proposed external 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 possible presence of "...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...".

6.5. Table 6 below summarises the assessment of predicted noise rating levels. The full set of calculations is presented in **Appendix F**.

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

Receptor	Period	Predicted rating level 1m from receptor, L_{Aeq} (dB)	Design criterion (dB)	Difference (dB)
Receptor R1	Daytime (07.00 – 01.00 hours)	34	37	-3
	Night-time (07.00 – 23.00 hours)	n/a*	32	n/a

**Plant is switched off during the night-time period*

6.6. External noise level predictions demonstrate that cumulative noise emissions from the proposed plant meet the proposed criteria given in Table 4 of this report and, therefore, should comply with the criteria typically set by London Borough of Hillingdon Council, providing the specified attenuators are installed.

Context and uncertainties

6.7. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.

6.8. 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 noise sensitive windows. The impact on all other nearby windows will be lower due to screening and distance attenuation.
- It should be noted that the above assessment is based on all plant operating at maximum duty. The resulting impact will be lower when plant is operating at a reduced duty (i.e. when the heating/cooling demand of the Funeralcare is reduced).

6.9. Given the results of the above assessment, cumulative noise emissions from fixed plant can be considered of 'low impact' in accordance with BS 4142:2014 methodology.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Co-operative to undertake a noise assessment for new ventilation plant serving the Co-op Funeralcare at Uxbridge Rd in Hayes.

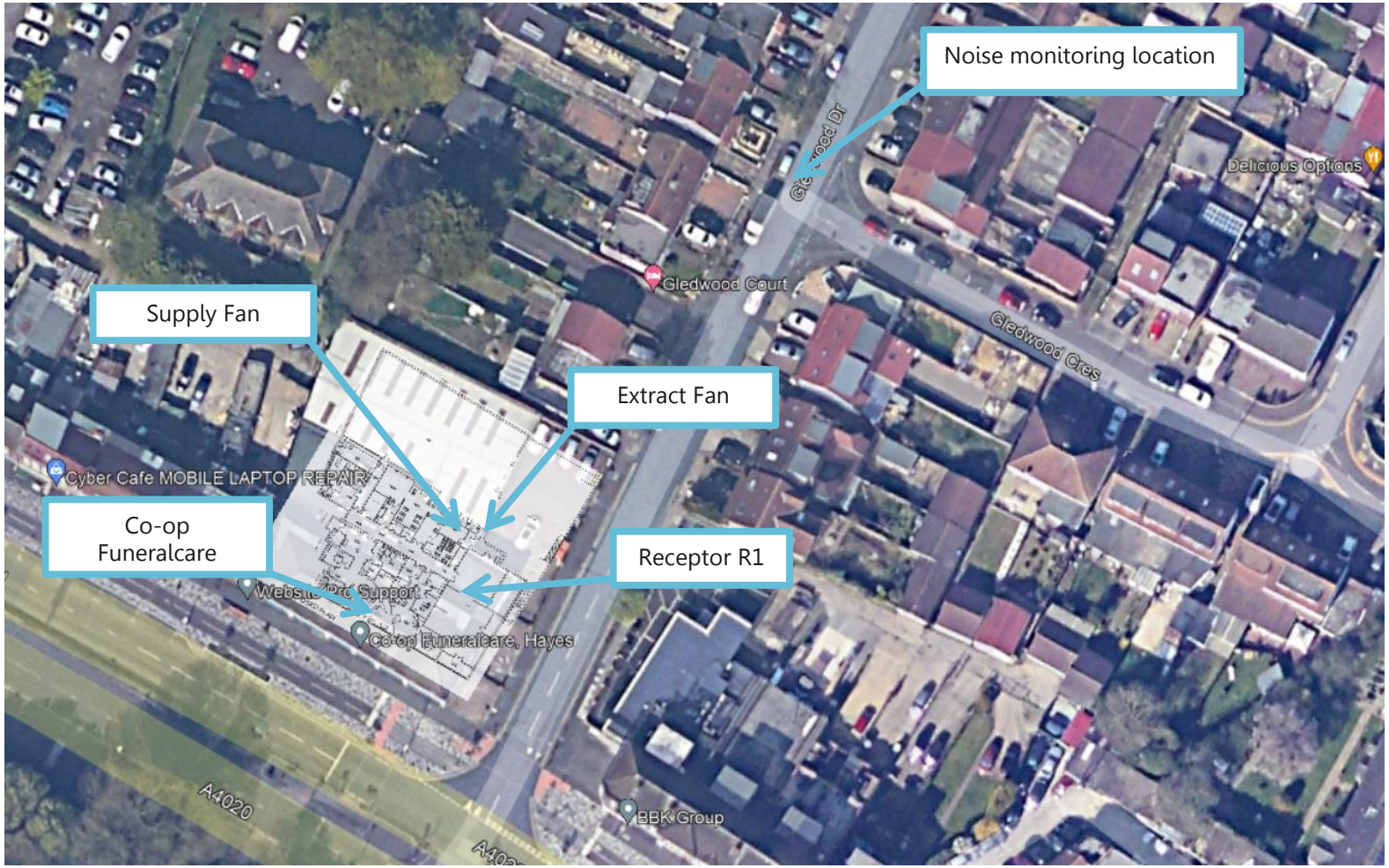
7.2. The cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed against typical noise criteria from the local authority.

7.3. The results of the assessment indicate that, when attenuated as described in this report, the plant will comply with the proposed criteria. Noise should therefore not be a reason for refusal of planning permission.

Appendix A Acoustic terminology

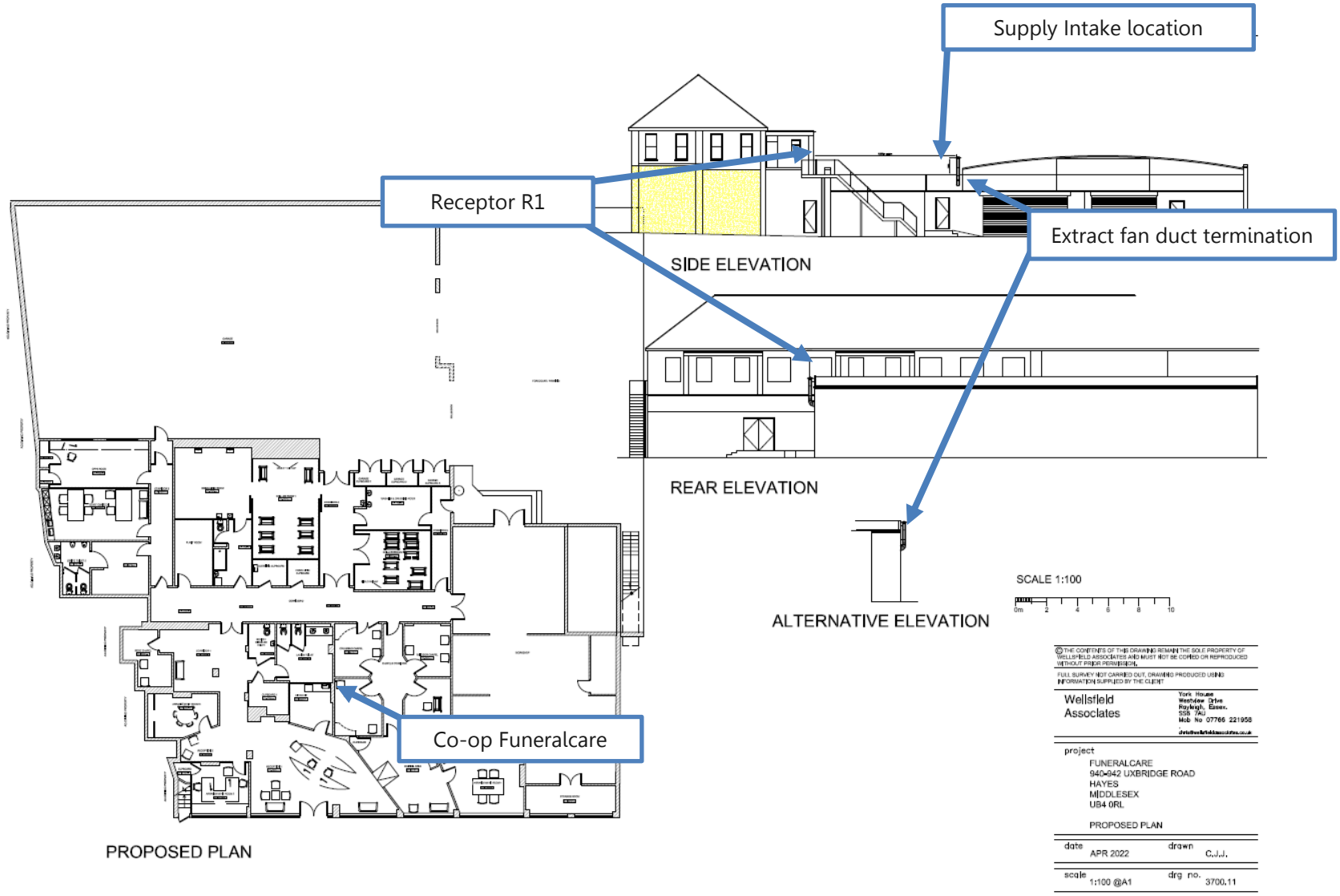
Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). 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 20μPa. 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 Leq 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



Photograph 1 Courtesy of Google Earth

Appendix C Proposed site and layout drawings



Appendix D Environmental sound survey

Details of environmental sound survey

D.1 Measurements of the existing background sound levels were undertaken between 16.45 hours on Wednesday 23 March and 10.00 hours on Thursday 24 March 2022.

D.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

D.3 The sound level meter was positioned on a lamppost on Gledwood Drive. The approximate location of the microphone is indicated on the plan in **Appendix B**.

D.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

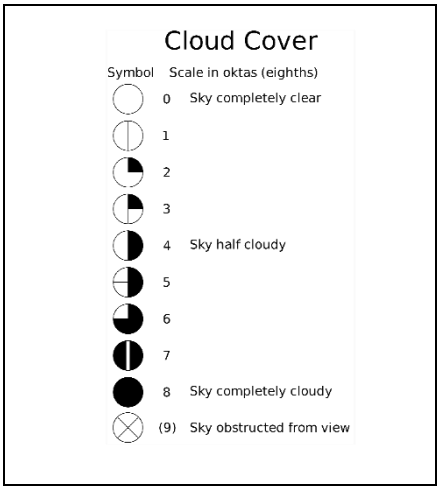
D.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977 / 36190	25/05/2021	1500077-1
Condenser microphone	ACO Pacific 7052E / 74975		
Preamplifier	Svantek SV12L / 10325		
Calibrator	Svantek SV33A / 73430	08/07/2021	1500622-1

Weather conditions

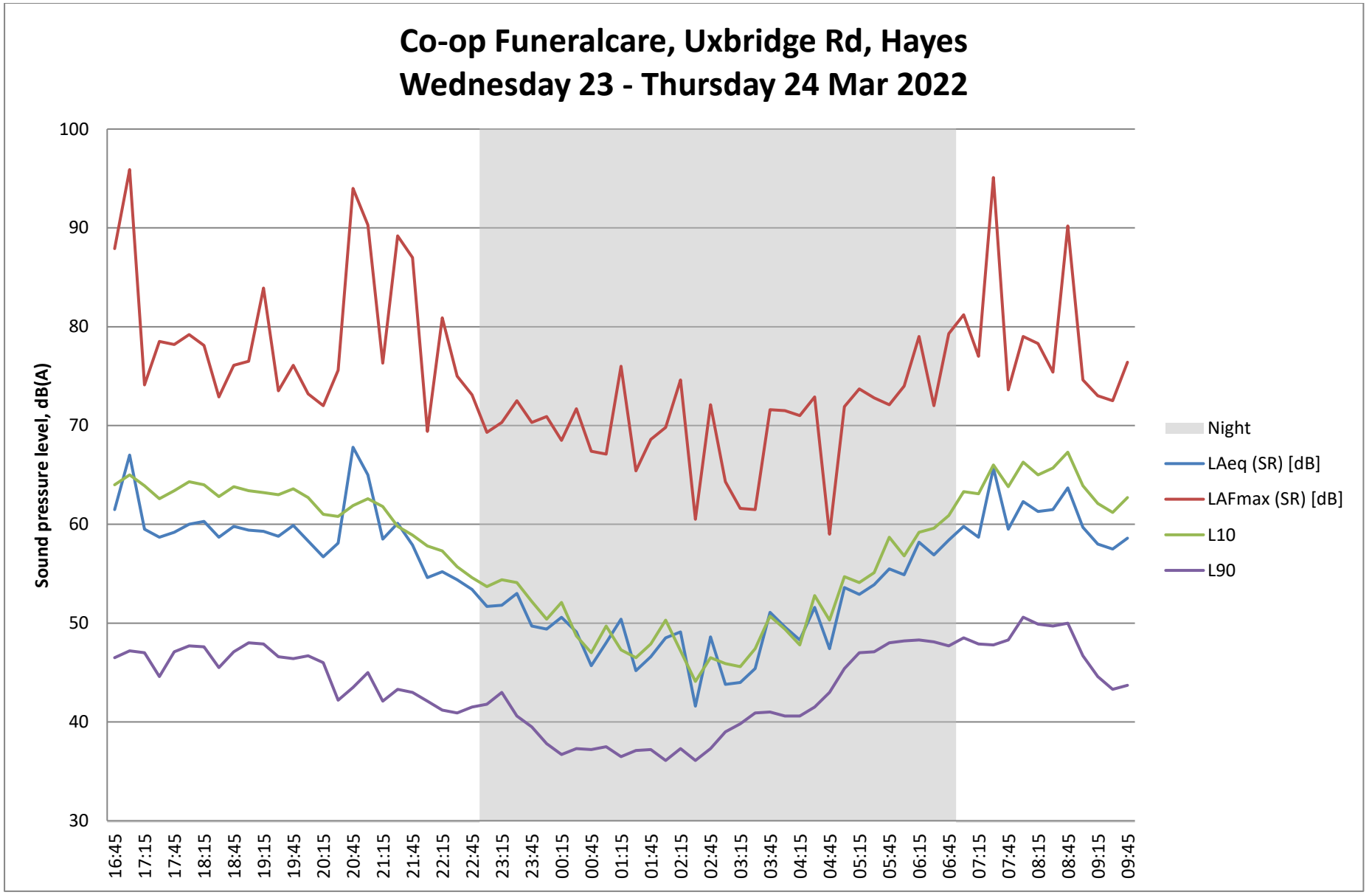
D.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	16.45 23 Mar - 10.00 24 Mar 2022	Temperature (°C)	19	16
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	1	0
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	0.3	0.3
		Wind Direction	SE	SE
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.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.

D.8 The predominant noise source affecting the area at the start and end of the survey was light traffic noise.


Co-op Funeralcare, Uxbridge Rd, Hayes
Wednesday 23 - Thursday 24 Mar 2022
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
16:45
17:15
17:45
18:15
18:45
19:15
19:45
20:15
20:45
21:15
21:45
22:15
22:45
23:15
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03:15
03:45
04:15
04:45
05:15
05:45
06:15
06:45
07:15
07:45
08:15
08:45
09:15
09:45
Night
LAeq (SR) [dB]
LAFmax (SR) [dB]
L10
L90

Appendix E Plant information and manufacturer published sound pressure levels

			Sound Power Level. dB @ octave band centre frequency, Hz							
Ref	**Make / Model**		**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SF	Auto Extract Systems / FB-075-3	In-duct intake	53	76	82	89	90	86	79	70
EF	Auto Extract Systems / FB-075-3	In-duct exhaust	53	76	82	89	90	86	79	70

Appendix F Plant noise calculations

Summary

Plant	Resultant at Receptor (dBA)
	R1
SF	28
EF	28

Operational Hours (07.00-23.00 Hours)	R1
Cumulative	**31**
BS 4142:2014 feature correction	3
BS 4142:2014 rating level	**34**
Target	37
Excess	**-3**

Supply Intake Fan (SF)

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	53	76	82	89	90	86	79	70	**93**
System losses		-12	-8	-4	-3	-3	-4	-5	-5	
Atmospheric side attenuator	I.L.	-6	-12	-24	-38	-45	-42	-38	-29	
Sound power level leaving terminal		**35**	**56**	**54**	**48**	**42**	**40**	**36**	**36**	**50**

Receptor R1	V angle	H angle									
Directivity correction	0	0	200 x 600 (0,0)	1	2	3	4	5	6	6	6	
Distance correction	9	m	9 m	-27	-27	-27	-27	-27	-27	-27	-27	
Screening correction	Screened:	0	δ= -9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			**L_p**	**9**	**31**	**30**	**25**	**20**	**19**	**15**	**15**	**28**

Extract Termination (EF)

Description	Notes.	Sound level (dB) at octave band centre frequencies (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Source noise level (unattenuated)	In-duct L_w	53	76	82	89	90	86	79	70	**93**
System losses		-13	-9	-5	-3	-3	-3	-3	-3	
Atmospheric side attenuator	I.L.	-6	-12	-24	-38	-45	-42	-38	-29	
Sound power level leaving terminal		**34**	**55**	**53**	**48**	**42**	**41**	**38**	**38**	**50**

Receptor R1	V angle	H angle									
Directivity correction	0	0	200 x 600 (0,0)	1	2	3	4	5	6	6	6	
Distance correction	9	m	9 m	-27	-27	-27	-27	-27	-27	-27	-27	
Screening correction	Screened:		δ= -9	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Surface corrections etc												
Resultant at Receptor R1			**L_p**	**8**	**30**	**29**	**25**	**20**	**20**	**17**	**17**	**28**