Sainsbury's
35 Hampstead High Street
Hampstead
NW3 1QE

Plant Noise Impact Assessment

On behalf of

Sainsbury's

Project Reference: 89759 | Revision: 00 | Date: 20th April 2021

T: 01252 519881
W: noisesolutions.co.uk
E: hello@noisesolutions.co.uk
Noise Solutions Ltd, Unit 5, Oriel Court, Omega Park, Alton, GU34 2YT Reg no. 3483481

Document Information

Project Name	:	**Sainsbury's, Hampstead High Street**
Project Reference	:	**89759**
Report Title	:	**Plant Noise Impact Assessment**
Doc Reference	:	**89759/NIA**
Date	:	**20th April 2021**

	Name	Qualifications	Initials	Date
Prepared by:	Dean Bowden	BSc(Hons), MIOA	DMB	20th April 2021
Reviewed and approved by:	Jon Stump	BSc(Hons), MIOA	JS	20th April 2021
For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

Reg no. 3483481 Trading office Unit 5, Oriel Court, Omega Park, Alton, Hampshire, GU34 2YT

Contents

Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Sainsbury's to undertake a noise impact assessment for new internal and external plant serving a proposed Sainsbury's store at 35 Hampstead High Street.

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. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed using the typical requirements of London Borough of Camden.

1.4. A glossary of acoustic terminology is given 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. New plant is to be installed to serve the Sainsbury's store at 35 Hampstead High Street.

2.2. A new refrigeration gas cooler is proposed within the external yard to the rear (north) of the site. Absorptive wall lining will be fitted to the store façade in the vicinity of the unit in order to minimise the effects of reflected sound.

2.3. A new VRF AC unit is to be located within an internal plant room on the first floor of the building. Airflow will be maintained to the plant room via a louvre on the north elevation. The plant room is to be fitted with suitable atmospheric-side attenuation internally.

2.4. The refrigeration plant will operate at all times, although generally at a lower duty at night when demands for cooling are reduced. The AC unit will operate only when the store is open.

2.5. **Appendix C** contains a table with the manufacturer's published sound pressure levels for the proposed plant.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is a mix of commercial and residential premises. The nearest noise-sensitive receptors (Receptor R1) to the new plant are on Spencer Walk, to the rear of the store, approximately 11m from the closest plant item.

3.2. It is understood there are no residential premises within the proposed Sainsbury's building.

3.3. The locations of the store, plant and receptor are shown in **Appendix B**.

4.0 Existing noise climate

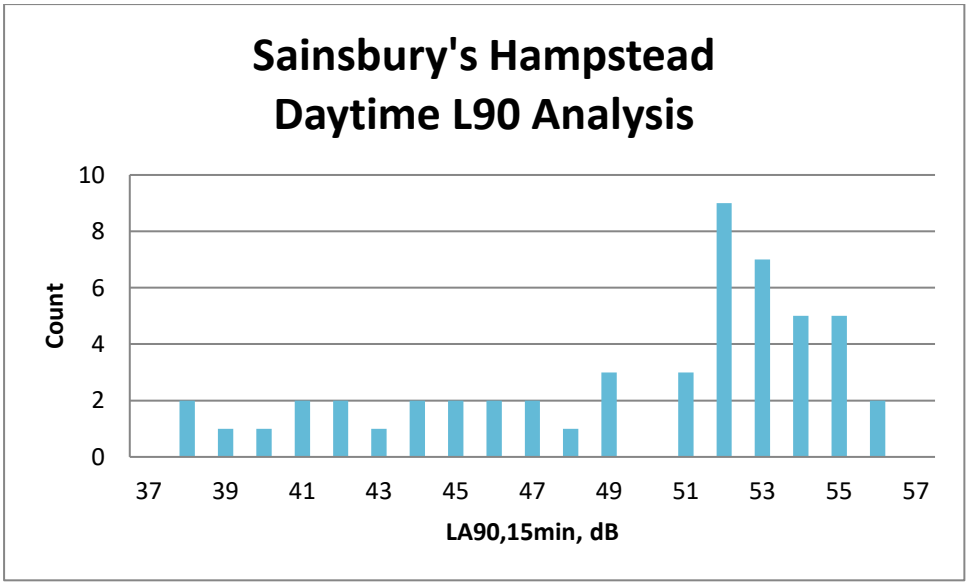
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in **Appendix 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)	56-66	68-93	60-68	38-56
Night (23.00 – 07.00 hours)	45-60	66-80	40-65	31-44

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



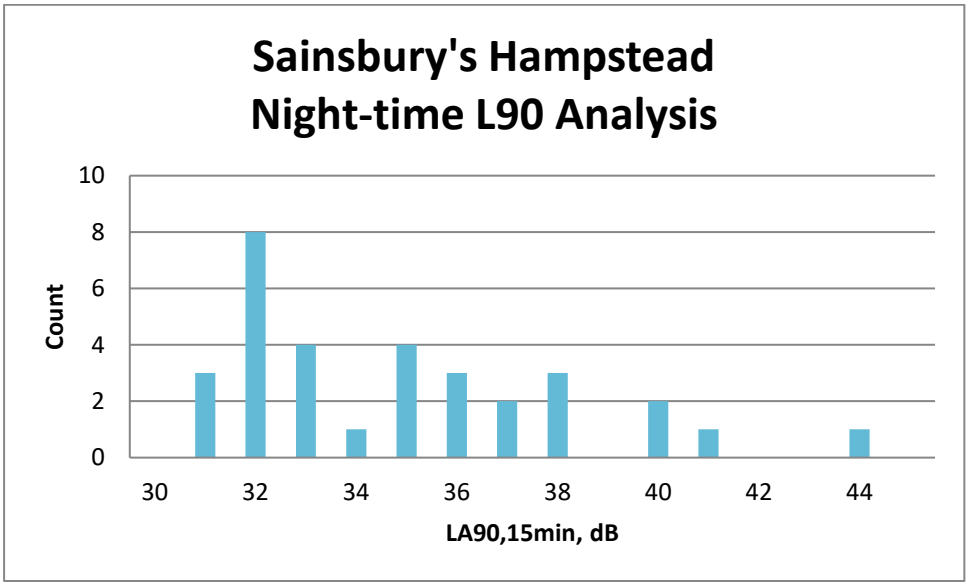
4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

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

dB, L_{A90} daytime period	
Mean	49
Mode	52
Median	52

4.4. From the histogram analysis, 43dB 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	35
Mode	32
Median	34

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

- 43dB L_{A90} during the daytime period; and
- 32dB L_{A90} during the night-time period.

Covid-19

4.8. It should be noted that the environmental noise survey discussed in this report was undertaken in January 2021, at a time when the coronavirus pandemic was causing a disruption to typical working patterns and other activity. It is therefore likely that recorded sound levels are slightly lower than would otherwise be expected where dominated by road or air traffic. While the data should therefore be treated with an element of caution, where it has been used to establish background sound levels it is likely to understate the more-usual background sound levels and therefore result in a robust assessment.

5.0 Plant noise design criteria

London Borough of Camden

5.1. Section 6 of the Camden Planning Guidance Amenity, published March 2018, gives guidance on noise and vibration.

5.2. Clause 6.8 refers to noise thresholds within Appendix 3 of the Local Plan and to the principles of No observed effect level (NOEL), Lowest observable adverse effect level (LOAEL) and Significant observed adverse effect level (SOAEL) and defines their meanings. Specifically, in the context of this report, LOAEL is defined as:

> *The level above which changes in behaviour (e.g. closing windows for periods of the day) and adverse effects on health (e.g. sleep disturbance) and quality of life can be detected.*

5.3. SOEAL is defined as:

> *The level above which adverse effects on health and quality of life occur. This could include psychological stress, regular sleep deprivation and loss of appetite.*

5.4. Clause 6.27 states that:

> *Developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the council accompanying any acoustic report. "BS4142 Method for rating Industrial and Commercial Sound' contains guidance and standards which should also be considered within the acoustic report.*

5.5. Appendix 3 within the Camden Local Plan published 2017 states:

> *"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and*

assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."

5.6. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

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

5.7. 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".

5.8. 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.

5.9. 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.

5.10. 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."

5.11. 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."

5.12. 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.*

5.13. 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."

5.14. 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."

5.15. 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."*

5.16. 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.

Notes on BS 4142:2014 and Camden Local Plan Appendix 3

5.17. It should be noted that a plant rating noise level equal to the background sound level would be considered to have a "low impact, depending on the context" using BS 4142, and would fall into the "Amber" category with the Camden Local Plan.

Low background sound levels

5.18. As described in BS 4142:2014, where background noise levels are low it is appropriate to consider the absolute noise level. From guidance published by the World Health Organization[1] when windows are partially open for ventilation internal noise levels within dwellings are typically 15dBA lower than the noise level at the façade. Therefore, a plant noise level of 30dBA at the nearest residential window would result in internal noise levels of around 15-20dBA when windows are open, a level lower than that resulting from domestic refrigerators etc. within the dwellings.

Summary of requirements

5.19. The local authority's usual requirement is that the plant noise level at the nearest noise-sensitive windows should be at least at least 10dB below the representative L_{A90} background sound level. However, due to the low background sound levels at night, and in accordance with advice in BS 4142:2014, it is proposed to set a lower plant noise limit of 30 dBA during the night-time period.

[1] World Health Organization Regional Office for Europe, *Environmental Noise Guidelines for the European Region*, 2018

5.20. A summary of the recommended plant noise limits is given in Table 4.

Table 4 Proposed plant noise level at noise sensitive residential receptors

Period	Cumulative plant noise level, dB(A)
Daytime (07.00 – 23.00 hours)	33
Night-time (23.00 – 07.00 hours)	30

5.21. These limits will result in a plant noise rating level at or below that at which a "low impact" would be expected, according to the method described in BS 4142:2014.

6.0 Plant noise impact assessment

6.1. The cumulative plant sound pressure level at the most affected noise sensitive receptor has been predicted based on manufacturer's data for the proposed equipment.

6.2. For the gas cooler, the assessment has taken into consideration distance attenuation and the losses attributed to the proposed acoustic wall lining. Calculations of the VRF plant room have considered reverberation, aperture size, directivity and distance attenuation. The predictions are inclusive of the losses due to attenuators with the following acoustic performance:

Table 5 Insertion losses(dB) for plantroom attenuators at octave band centre frequencies (Hz)

Attenuator	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Intake	13	26	40	45	45	45	45	45
Discharge	13	26	40	45	45	45	45	45

6.3. The predictions have been based on all plant operating at maximum duty during the daytime period, and the refrigeration plant only operating at maximum duty during the night-time period.

6.4. 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...*".

6.5. Table 6, below, summarises the assessment of cumulative sound pressure levels of the proposed plant at the nearest noise-sensitive windows. All other nearby receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix E**.

Table 6 Assessment of noise levels at nearby receptor due to proposed plant

Receptor	Period	Predicted plant noise rating level at receptor, L_{Aeq} (dB)	Criterion, dB(A)	Difference (dB)
R1	Daytime period (07.00 – 23.00 hours)	32	33	-1
	Night-time period (23.00 – 07.00 hours)	30	30	0

6.6. The above assessment demonstrates that cumulative plant noise levels will be at or below the proposed noise limits at the nearest residential properties.

Uncertainties

6.7. 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 position was representative of the noise climate outside the nearby residential dwellings and not in a position where higher noise levels were present.

6.8. All reasonable steps have been taken to robustly assess noise from the proposed plant.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Sainsbury's to undertake a noise impact assessment for new plant serving a proposed Sainsbury's Local store located at 35 Hampstead High Street.

7.2. 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.

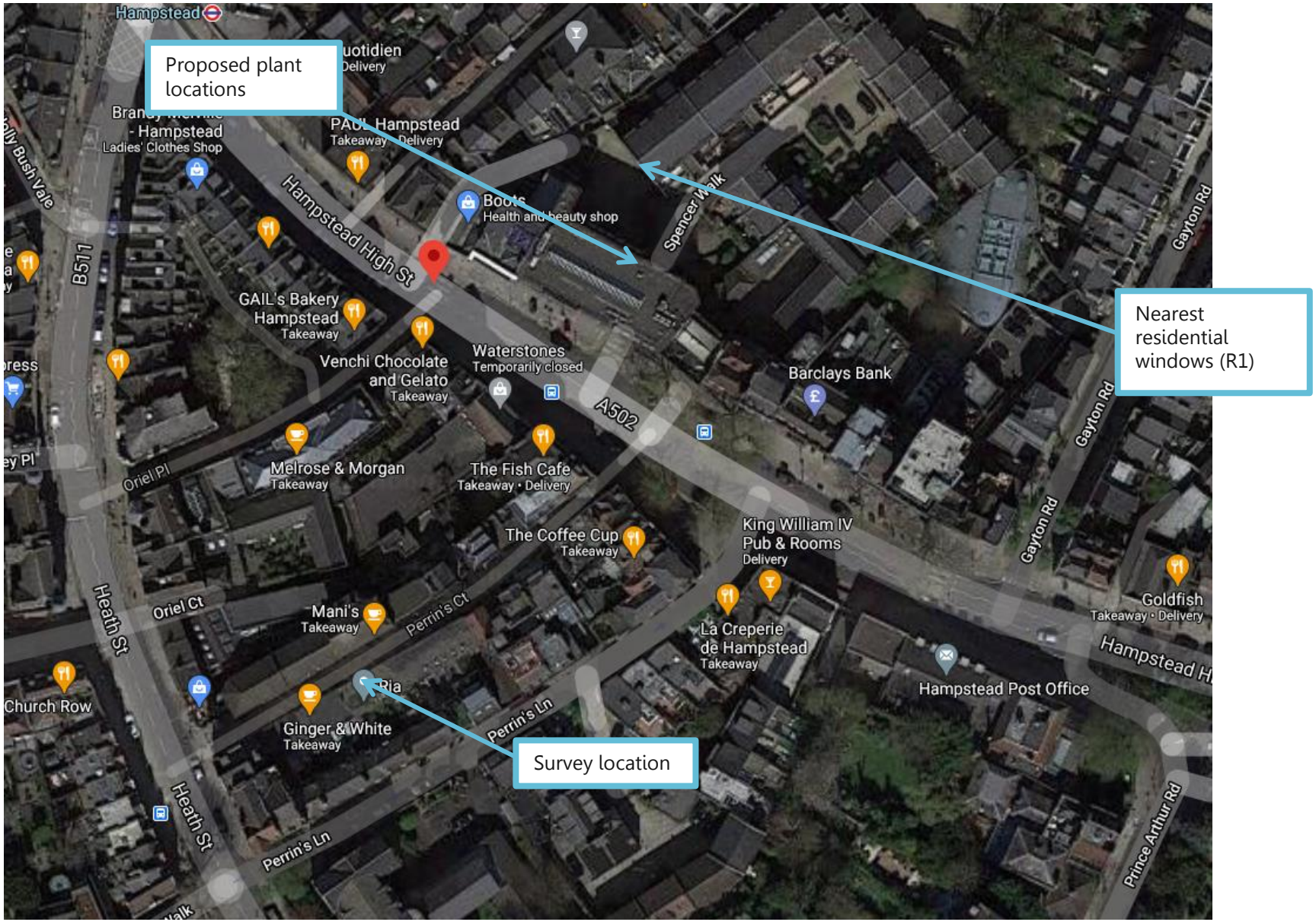
7.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed using the typical requirements of the London Borough of Camden.

7.4. The assessment has demonstrated compliance with the proposed criteria. Therefore, noise from the proposals should not be a reason for refusal of planning permission.

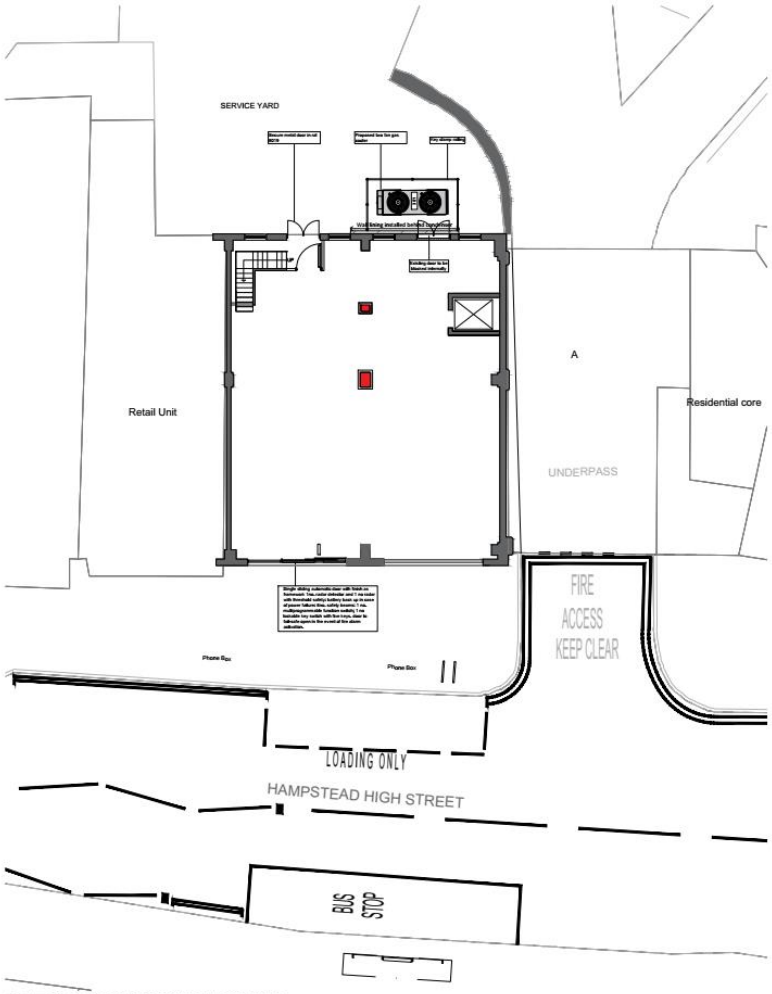
Appendix A Acoustic terminology

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 $\log_{10}$ (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 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.

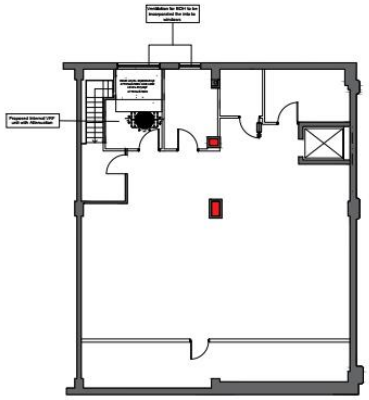
Appendix B Photograph and drawings of site showing areas of interest



DO NOT SCALE FROM THIS DRAWING - STATED DIMENSIONS REFER. CONTRACTORS SHALL BE RESPONSIBLE FOR THE CHECKING OF ALL STATED DIMENSIONS, WITH ANY ANOMALIES BEING IDENTIFIED TO THE ORIGINATOR PRIOR TO ANY CONSTRUCTION OR FABRICATION WORKS COMMENCING.



1 P186082110 PROPOSED GROUND FLOOR PLAN
1:200@A3



2 P186082110 PROPOSED FIRST FLOOR PLAN
1:200@A3

0 2 4 6 8 10m
SCALE 1:200 @A3

Rev.	Date	Description	
B	12.04.21	Plant Area Amended	JN
A	24.03.21	Doors blocked	DH
--	23.03.21	First issue	JN

architects
project managers
cost consultants

jla

2nd Floor
13 Swan Yard
Islington, London
N1 1SD
tel: 0203 637 9988

Status

Project Title
SAINSBURY'S LOCAL
HAMPSTEAD,35 HIGH STREET
LONDON, NW3 1QE

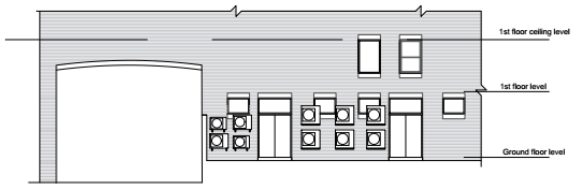
Drawing Title
EXISTING AND PROPOSED GROUND FLOOR PLAN

Project Number	Drawing Number	Revision
S-186082	P-186082-110	B

Drawn	Checked	Scale	Date
JN	VA	1:200@A3	23.03.21

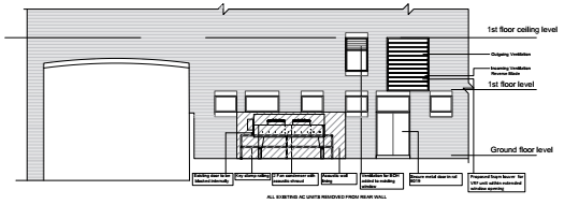
DO NOT SCALE FROM THIS DRAWING - STATED DIMENSIONS REFER. CONTRACTORS SHALL BE RESPONSIBLE FOR THE CHECKING OF ALL STATED DIMENSIONS, WITH ANY ANOMALIES BEING IDENTIFIED TO THE ORIGINATOR PRIOR TO ANY CONSTRUCTION OR FABRICATION WORKS COMMENCING.

01 P186082205 EXISTING ELEVATION
1:200@A3



03 P186082205 EXISTING REAR ELEVATION
1:200@A3

02 P186082205 PROPOSED ELEVATION
1:200@A3



04 P186082205 PROPOSED REAR ELEVATION
1:200@A3

0 2 4 6 8 10m
SCALE 1:200 @A3

Rev.	Date	Description	
B	16.04.21	General Amendments	JN
A	24.03.21	Rear elevation	DH
--	23.03.21	First issue	JN

architects
project managers
cost consultants

2nd Floor
13 Swan Yard
Islington, London
N1 1SD
tel: 0203 637 9080

jla

Status

Project Title
SAINSBURY'S LOCAL
HAMPSTEAD,35 HIGH STREET
LONDON, NW3 1QE

Drawing Title
EXISTING AND PROPOSED ELEVATIONS

Project Number	Drawing Number	Revision
S-186082	P-186082-205	B

Drawn	Checked	Scale	Date
JN	VA	1:200@A3	23.03.21

Appendix C Manufacturer noise data

Plant item	Make/Model	Quantity	Notes	dBA								dBA
				63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
AC	Mitsubishi / PURY-EM250YNW-A1	1	L_w	88	82	81	79	73	69	70	63	80
Refrigeration gas cooler	Kelvion / GF-MA102G4/5684747	1	L_p @ 10m	24	24	22	23	25	18	14	6	27
			L_p @ 10m	24	24	22	23	25	18	14	6	27

Appendix D Environmental sound survey

Details of environmental sound survey

D.1 Measurements of the existing background sound levels were undertaken from 15.45 hours on Tuesday 26th January to 12.30 hours on Wednesday 27th January 2021.

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 representative measurement position was located on a lamppost on Perrin's Court (location indicated on the site plan in **Appendix B**). In accordance with BS 7445-2:21991 *'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.

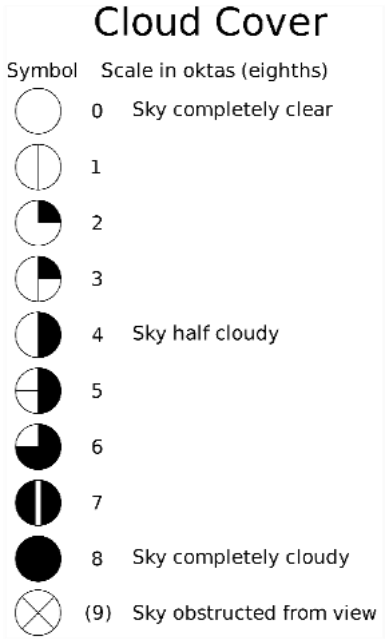
D.4 The survey location was selected to avoid the possible influence of plant at the rear of the store, serving other premises.

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.

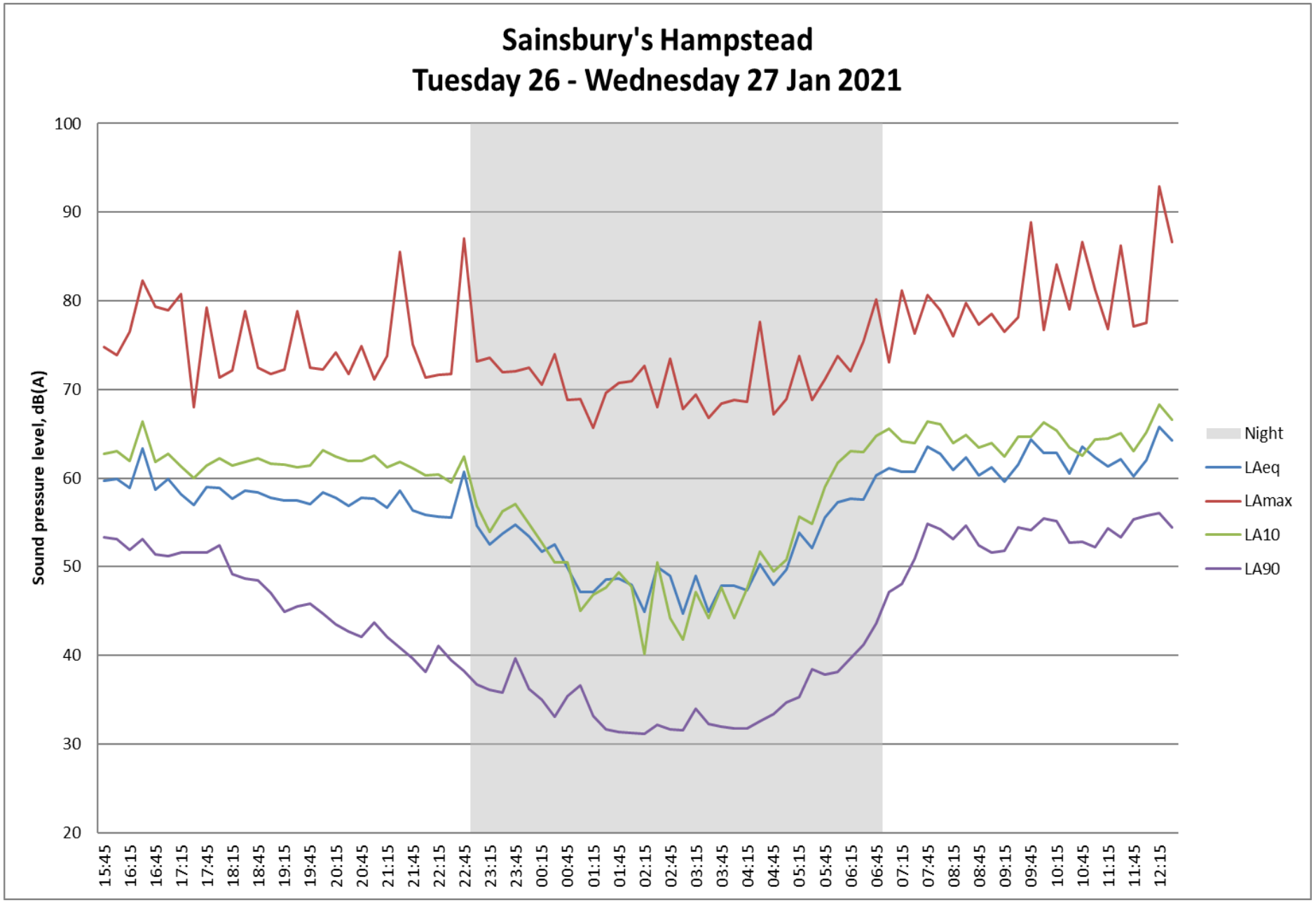
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	29/05/2019	UCRT19/1634
Condenser microphone	Rion UC-59 /08290		
Preamplifier	Rion NH-25 / 54080		
Calibrator	Rion NC-74 /34235932	20/08/2020	TCRT20/1469

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	**Time/Date**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	15.45 26 Jan – 12.30 27 Jan 2021	Temperature (°C)	6	8
		Precipitation:	Spitting	None
		Cloud cover (oktas – see guide)	8	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Damp	Wet
		Wind Speed (m/s)	1	Still
		Wind Direction	SW	-
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.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 distant road traffic. The results of the survey are presented in a time history graph overleaf.


Sainsbury's Hampstead
Tuesday 26 - Wednesday 27 Jan 2021
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
20
15:45
16:15
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
23:45
00:15
00:45
01:15
01:45
02:15
02:45
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
10:15
10:45
11:15
11:45
12:15
Night
LAeq
LAmax
LA10
LA90

Appendix E Noise level predictions

Description	Notes	dB								dB(A)
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
VRF intake										
Reverberant level in plant room	Rev Lp	90	84	83	80	72	66	67	61	81
Opening area (m2)	3	4	4	4	4	4	4	4	4	
SRI of opening	I.L.	-13	-26	-40	-45	-45	-45	-45	-45	
Inside-outside correction		-6	-6	-6	-6	-6	-6	-6	-6	
Lw of opening	Lw	75	56	41	33	25	19	20	14	50
Directivity correction	0, 0	3	4	5	6	6	6	6	6	
Distance correction	13	-30	-30	-30	-30	-30	-30	-30	-30	
BS 4142:2014 correction		3	3	3	3	3	3	3	3	
Resultant at receptor	Lp @ R1	51	32	19	12	4	-2	-1	-7	25
VRF discharge										
Sound power level of fans	Lw	88	82	81	79	73	69	70	63	80
End reflection	3	-2	0	0	0	0	0	0	0	
SRI of opening	I.L	-13	-26	-40	-45	-45	-45	-45	-45	
Lw of opening		73	56	41	34	28	24	25	18	48
Directivity correction	0, 0	3	4	5	6	6	6	6	6	
Distance correction	13	-30	-30	-30	-30	-30	-30	-30	-30	
BS 4142:2014 correction		3	3	3	3	3	3	3	3	
Resultant at receptor	Lp @ R1	48	32	18	12	7	2	3	-3	23
Condenser (day)										
Sound pressure level	Lp @ 10m	24	24	22	23	25	18	14	6	27
Distance correction	11	-1	-1	-1	-1	-1	-1	-1	-1	
Reflections*		0	0	0	0	0	0	0	0	
BS 4142:2014 correction		3	3	3	3	3	3	3	3	
Resultant at receptor	Lp @ R1	26	26	24	25	27	20	16	8	30
Condenser (night)										
Sound pressure level	Lp @ 10m	24	24	22	23	25	18	14	6	27
Distance correction	11	-1	-1	-1	-1	-1	-1	-1	-1	
Reflections*		0	0	0	0	0	0	0	0	
BS 4142:2014 correction		3	3	3	3	3	3	3	3	
Resultant at receptor	Lp @ R1	26	26	24	25	27	20	16	8	30
Cumulative										
Resultant at receptor (day)	Lp @ R1	53	35	26	26	27	20	16	9	32
Resultant at receptor (night)	Lp @ R1	26	26	24	25	27	20	16	8	30

**reflections minimised through the installation of acoustic wall lining behind the plant.*