NSL
Noise Solutions Ltd

59-61 High Street
Hampton Wick
KT1 4DG

Plant Noise
Impact Assessment

Project Reference: 92219| Revision: 05 | Date: 29th April 2024
Revised: 20th June 2024

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

Document Information

Project Name	:	**59 – 61 High Street, Hampton Wick**
Project Reference	:	**92219**
Report Title	:	**Plant Noise Impact Assessment Report**
Doc Reference	:	**92219/NIA**
Date	:	**29th April 2024**

	Name	Qualifications	Initials	Date
Prepared by:	Dafydd Davies	BSc(Hons)	DD	29th April 2024
Reviewed and approved by:	Nigel Chandler	BSc(Hons), MIOA	NAC	30th April 2024
For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/Approved
01	01/05/2024	Client comments	DD	DMB
02	01/05/2024	Client comments	DD	DMB
03	01/05/2024	Client comments	DD	DMB
04	12/06/2024	Updated plant	DMB	JS
05	20 June 2024	Additional receptor added as requested	NAC	JS

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

Contents

Appendices

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment for proposed plant at 59-61 High Street, Hampton Wick, KT1 4DG.

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 receptors and assessed against the local authority's usual requirements.

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 new proposed plant will be located in an external plant area at the rear of the site to the south west.

2.2. External plant is to comprise a refrigeration gas cooler and three new AC condensers. A refrigeration pack will be located internally and will not give rise to external noise.

2.3. The refrigeration plant may operate at all times. The exact operating times of the AC units are unknown, however, it is understood they will not operate during the night-time period (23.00 – 07.00 hours).

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is predominantly residential in nature, although there are commercial offices located within the building next to the site

3.2. The nearest noise sensitive receptors will be the residential properties in the building next to the site, to the north (Receptor R1).

3.3. There are also residential properties to the rear of the building, at 2 Jubilee Court (Receptor R2).

3.4. Additionally, there are commercial offices to the northwest of the proposed plant area, occupying the ground floors of the building next to the site (Receptor R3).

3.5. The rear windows of the flats above the premises (Receptor R4) are screened from the plant by the rear extension of the building.

3.6. A site plan showing the site and surrounding area, the nearest noise sensitive properties and noise monitoring location used in this assessment is presented in **Appendix B**.

4.0 Existing noise climate

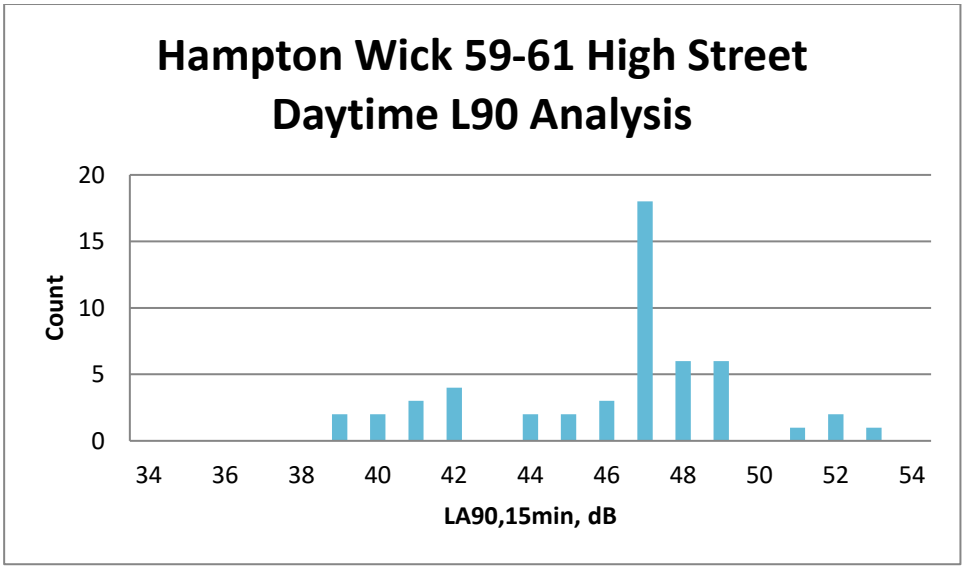
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area, during the quietest times at which the plant will operate.

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)			
	$L_{Aeq(15mins)}$	$L_{AFmax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	50-65	66-97	54-61	39-53
Night-time (23.00 – 07.00 hours)	42-62	64-76	41-63	35-47

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

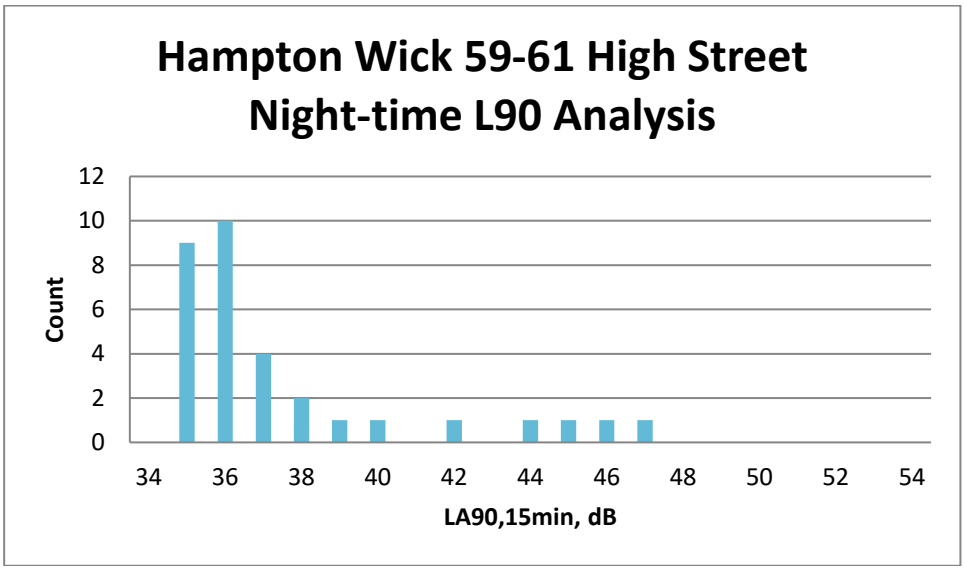


4.3. Further statistical analysis has been carried out on the data, and the mean, modal and median values are shown in Table 2 below.

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

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

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



4.4. Further statistical analysis has been carried out on the data and the mean, modal 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	38
modal	36
median	36

4.5. 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
- 35dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

London Borough Richmond Upon Thames

5.1. London Borough of Richmond upon Thames adopted their Supplementary Planning Document *Development Control for Noise Generating and Noise Sensitive Development* in September 2018.

5.2. Section 6.0 of the SPD includes guidance on acceptable sound levels from new services plant. The relevant part of *Table 2: New Industrial and Commercial Development* states:

> *Where the rating level of noise is below the background noise level by at least 5dB, this indicates that the proposed NGD is likely to be acceptable from a noise perspective. The Borough will seek this level of compliance in most noise sensitive areas and/or where there is a requirement to mitigate creeping background effects.*

BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

5.3. BS 4142:2014 +A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014[1] includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.4. 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.

5.5. 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.

5.6. 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."*

5.7. 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."*

5.8. 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;*

[1] For brevity, references to BS 4142 and BS 4142:2014 should be read as BS 4142:2014 + A1:2019

- *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.*

5.9. 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.*"

5.10. 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."*

5.11. 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."

5.12. 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 applicable emissions criteria

Residential

5.13. To comply with the local authority's usual requirements, it is proposed that the rating level of the plant should be at least 5dB below the existing background noise level at the nearest receptor.

5.14. Table 4 below presents the proposed plant noise rating level at the nearest residences.

Table 4 Proposed plant noise rating level at noise sensitive residential receptors

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	37
Night-time (23.00 – 07.00 hours)	30

5.15. It should be noted that the above criteria are below the level which would have a "low impact, depending on the context" using BS 4142:2014.

5.16. The above limits have not been approved by the local authority at this stage.

Offices

5.17. Typically, local authorities do not consider office spaces to be as sensitive to noise as residential properties and, therefore, emissions criteria are generally relaxed at these locations.

5.18. It is considered appropriate to control plant noise levels to meet the recommended internal noise levels provided in BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings'* for indoor amenity within office spaces. The standard states a range of noise levels for various spaces used for 'study and work requiring concentration' between 35 and 50dB L_{Aeq}.

5.19. BS8233 gives general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states that:

> *If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB.*

5.20. This implies that should windows on a noise affected façade be openable, a sound insulation value of 15dB should be applied to the whole façade to an internal room being assessed. It should be noted that a sound insulation performance of much greater than 15dB is expected for non-openable standard double glazed windows. However, in order to assess the worst case scenario, this report assumes that windows may be opened if desired.

5.21. Based on the above and assuming a worst case internal criterion of 35dB L_{Aeq}, cumulative plant noise levels at the façade of the nearest commercial premises should not exceed 50dB L_{Aeq}.

6.0 Plant noise impact assessment

6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted based on manufacturer noise data, as shown in Table 4.

Table 4 Manufacturer's plant noise data

Reference	Make/model	Manufacturer plant noise level at source	
		L_p (dBA)	Distance (m)
AC1	Mitsubishi / PUZ-ZM71VHA2	49	1
AC2	Mitsubishi / PUZ-ZM35VKA	46	1
AC3	Mitsubishi / PUZ-ZM140VKA2	52	1
Gas cooler	TBC	24	10

6.2. The assessment has taken into consideration distance attenuation and directivity.

6.3. It should be noted that the typical plant is not anticipated to exhibit any tonal or impulsive characteristics providing it is well maintained. The new proposed plant is inverter driven and, therefore, will gently ramp up and down depending on the demands placed upon the system. 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...".*

6.4. Table 5 summarises the results of the assessment at the most affected properties, based on the plant noise levels given in Table 4. All other nearby receptors benefit from increased distance/screening to the plant such that resulting noise levels will be lower than at the receptors considered. The full set of calculations can be found in **Appendix D**.

Table 5 Assessment at the most affected properties.

Receptor	Period	Predicted rating level at receptor, L_{Aeq} (dB)	Criterion (dB)	Difference
R1	Daytime (07.00 - 23.00 hours)	35	37	**-2**
	Night-time (23.00 - 07.00 hours)	25	30	**-5**
R2	Daytime (07.00 - 23.00 hours)	37	37	**0**
	Night-time (23.00 - 07.00 hours)	28	30	**-2**
R3	Daytime (07.00 - 23.00 hours)	41	50	**-9**
R4	Daytime (07.00 - 23.00 hours)	24	37	**-13**
	Night-time (23.00 - 07.00 hours)	14	30	**-16**

6.5. The above assessment demonstrates that noise from the proposed plant will comply with the proposed criteria.

Context and uncertainties

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 nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.

- The noise level predictions are based on the proposed equipment running at maximum daytime duty. The plant will not run in this manner at all times (for example, when demands for heating/cooling are lower) and, therefore, this is a robust assessment.

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 positions were representative of the noise climate outside the nearby residential dwellings and not in positions where higher noise levels were present.

- The above guidance is based on a minimum distance of 4m between the proposed plant to the nearest receptors.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment of plant serving 59-61 High Street, Hampton Wick, KT1 4DG.

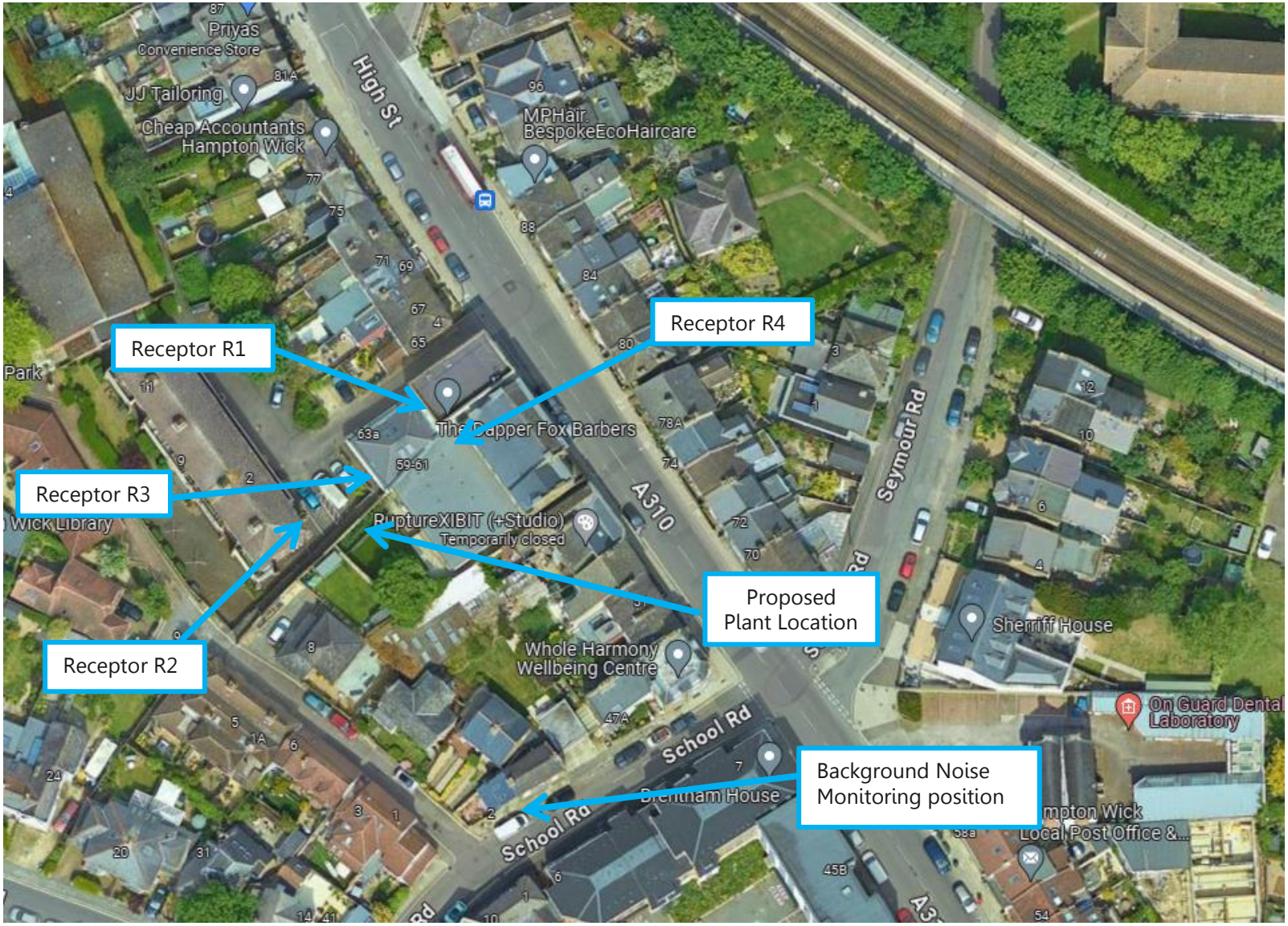
7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at locations representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.

7.3. Plant noise levels have been predicted at the nearest noise sensitive premises. Noise levels will meet London Borough of Richmond upon Thames Council's typical requirements and should therefore be acceptable.

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 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 Aerial photographs of site showing areas of interest




Receptor R1
Receptor R3
Receptor R2
Receptor R4
Home sweet home
A310
The Dapper Fox Barbers
RuptureXIBIT (+Studio)

Appendix C Environmental sound survey

Details of sound surveys

C.1 Measurements of the existing background sound levels were undertaken between 17.15 hours on Monday 18th March and 14.15 hours on Tuesday 19th March 2024.

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 lamp post on the north side of school road(locations 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

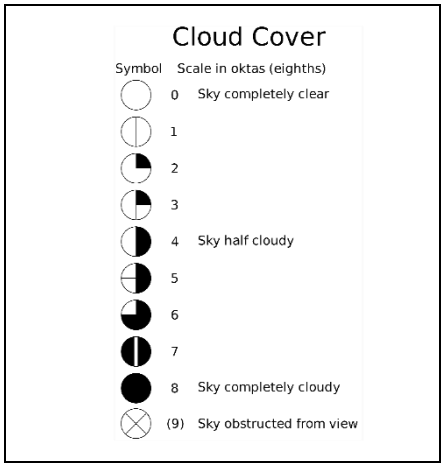
C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 69747	01/08/2022	1503080-1
Condenser microphone	ACO Pacific 7052E / 70829		
Preamplifier	Svantek SV12L / 73687		
Calibrator	Svantek SV30A / 10843	30/10/2023	1506985-1

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 generally appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

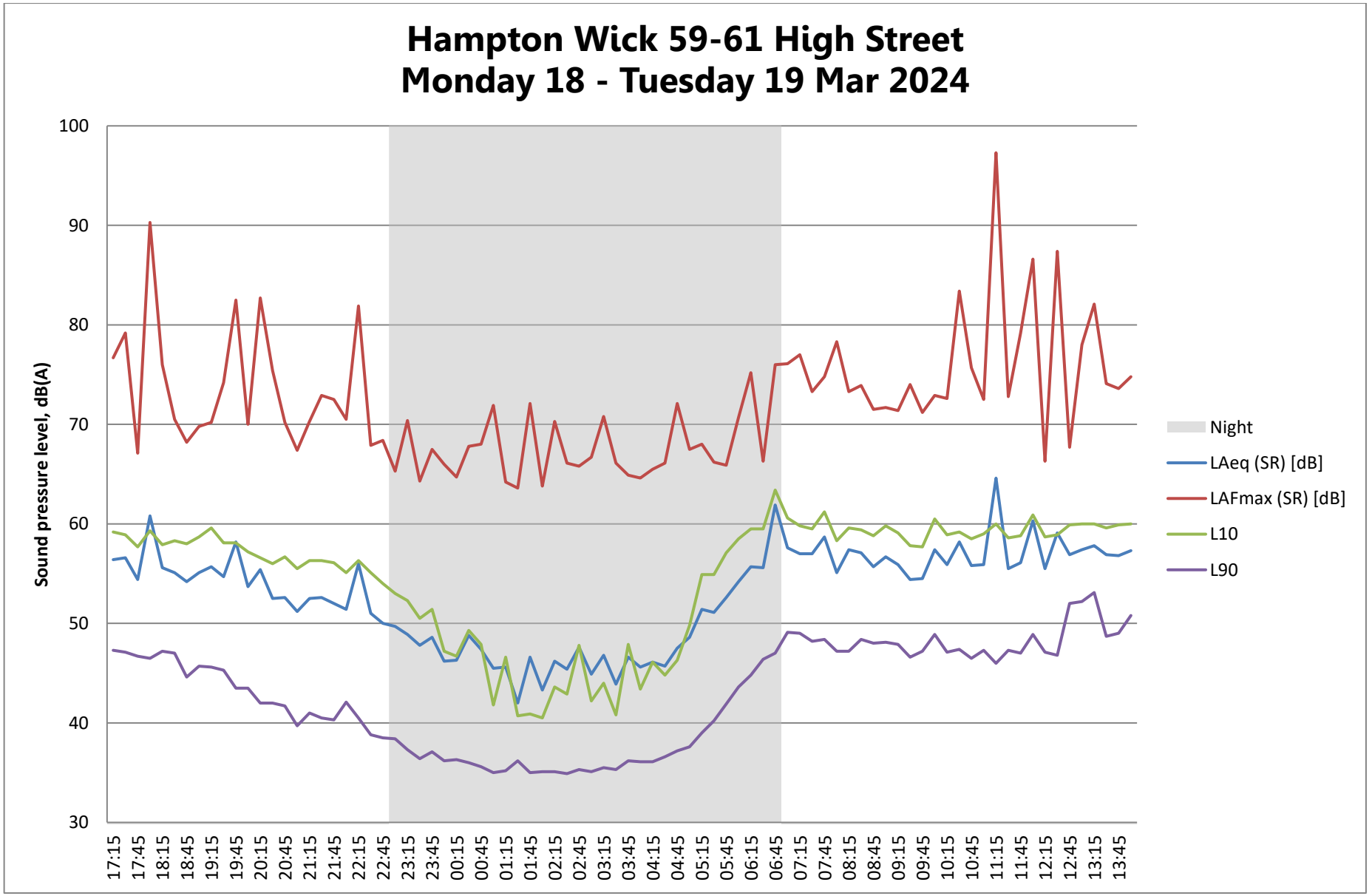
Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	17.15 18 Mar - 14.15 19 Mar 2024	Temperature (°C)	15	13
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	7	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	1.7	2.1
		Wind Direction	From S/W	From S/W
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	-	-

Results

C.7 The results of the survey are considered to be representative of the background sound pressure levels at the façades of the most affected noise sensitive receptors to the plant area during the quietest times at which the plant will operate.

C.8 The noise climate at the measurement position was dominated by local traffic noise on both set up and collection of the sound level meter. Additionally, some music was audible out of an open window during the collection of the sound level meter.

C.9 The results of the survey are presented in a time history graph overleaf.


Hampton Wick 59-61 High Street
Monday 18 - Tuesday 19 Mar 2024
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
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
12:45
13:15
13:45
Night
LAeq (SR) [dB]
LAFmax (SR) [dB]
L10
L90

Appendix D Noise level predictions

Receptor R1

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS4142 Feature Correction (dB)	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas Cooler	24	10	13	-2	0	0	3	25
ACU-1	49	1	14	-23	0	0	3	29
ACU-2	46	1	14	-23	0	0	3	26
ACU-3	52	1	14	-23	0	0	3	32
Cumulative rating level (day)								**35**
Cumulative rating level (night)								**25**

Receptor R2

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS4142 Feature Correction (dB)	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas Cooler	24	10	12	-2	3	0	3	28
ACU-1	49	1	15	-24	3	0	3	31
ACU-2	46	1	15	-24	3	0	3	28
ACU-3	52	1	15	-24	3	0	3	34
Cumulative rating level (day)								**37**
Cumulative rating level (night)								**28**

Receptor R3

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS4142 Feature Correction (dB)	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas Cooler	24	10	4	8	0	0	3	35
ACU-1	49	1	8	-18	0	0	3	34
ACU-2	46	1	8	-18	0	0	3	31
ACU-3	52	1	8	-18	0	0	3	37
Cumulative rating level (day)								**41**

Receptor R4

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS4142 Feature Correction (dB)	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas Cooler	24	10	15	-4	0	-10	3	13
ACU-1	49	1	15	-24	0	-10	3	18
ACU-2	46	1	15	-24	0	-10	3	15
ACU-3	52	1	15	-24	0	-10	3	21
Cumulative rating level (day)								**24**
Cumulative rating level (night)								**14**

Appendix E Proposed plant layout