Tesco Express
124 Tottenham Court Road
Bloomsbury
London
W1T 5AS

Plant Noise
Impact Assessment Report

On behalf of

Project Reference: 86008 | Revision: 00 | Date: 27th March 2020

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Document Information

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For and on behalf of Noise Solutions Ltd				

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Contents

Appendices

Executive Summary

Noise Solutions Limited has undertaken a noise impact assessment of new plant to be installed at the existing Tesco Express food store at 124 Tottenham Court Road in Bloomsbury.

The results of the assessment demonstrate that the cumulative plant noise emissions from the proposed external plant will comply with the proposed limits at the most affected noise sensitive receptors, without the need for mitigation measures.

Noise from the proposed plant should be considered acceptable to the London Borough of Camden.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Space Engineering Services to undertake a noise impact assessment for new plant serving the existing Tesco Express store on Tottenham Court Road in Bloomsbury.

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 using the typical requirements of the local authority.

1.4. A glossary of acoustic terminology is given in **Appendix A**.

2.0 Details of development proposals

2.1. The existing Tesco Express store is located at 124 Tottenham Court Road on the ground floor of the mid-terraced multi-storey building. Adjacent ground floor units are commercial in use with hotel accommodation on the floors above.

2.2. The new air conditioning (AC) and refrigeration plant is proposed to replace the existing units. The plant is located externally on the lower roof to the rear, along the south west elevation.

2.3. The proposed AC and refrigeration plant will potentially operate 24 hours a day, although it should be noted that these units operate as required to meet demand and generally at a reduced capacity at night.

2.4. **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 in use. The nearest noise sensitive property to the plant area will be the hotel rooms belonging to Radisson Blu Edwardian, Grafton (Receptor R1), approximately 8m from the nearest item of plant with direct line of sight.

3.2. **Appendix B** contains an aerial photograph showing the site and surrounding area.

4.0 Existing noise climate

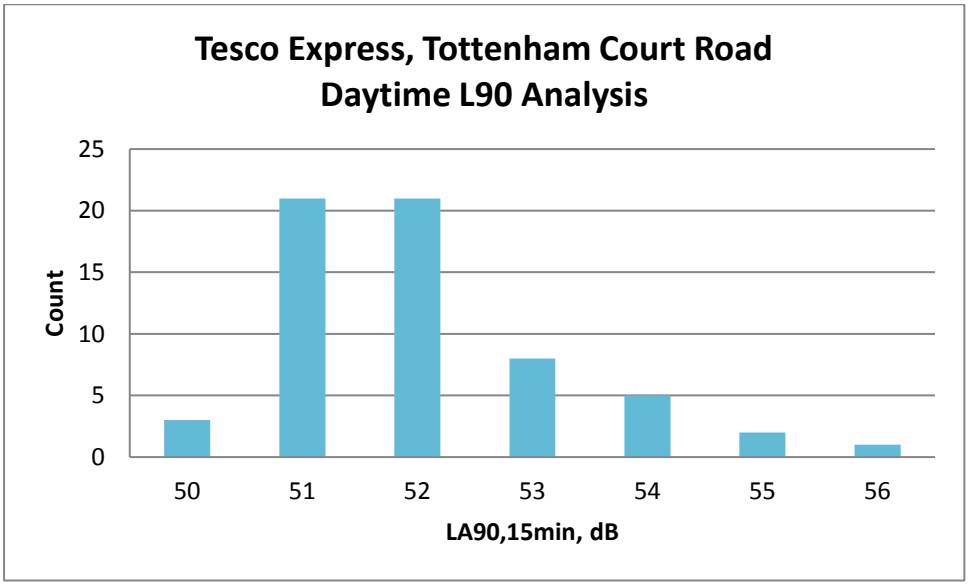
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

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)	54-73	72-102	56-69	50-56
Night-time (23.00 – 07.00 hours)	51-60	66-83	51-65	46-55

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



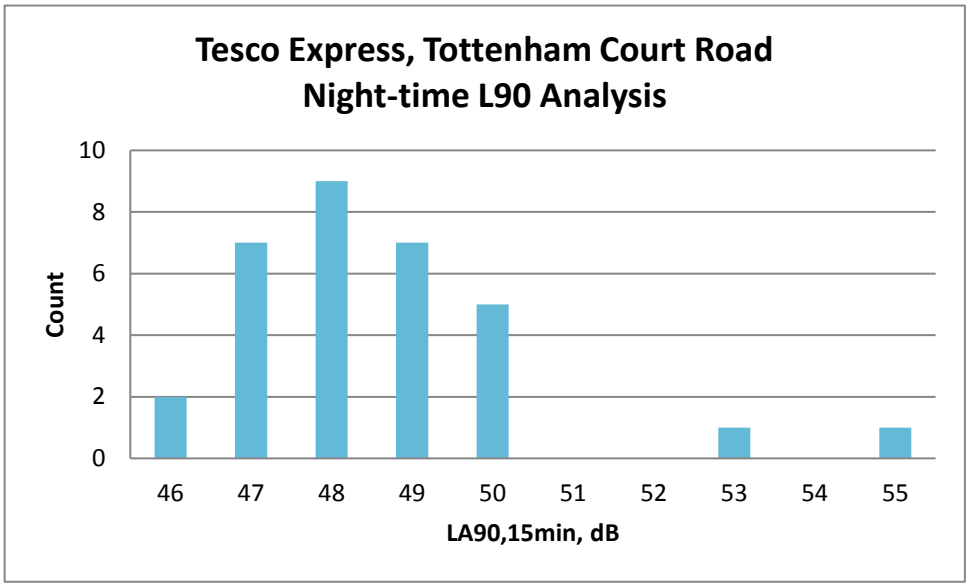
4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

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

dB, L_{A90} daytime period	
Mean	52
Median	52
Mode	51

4.4. The mean, median and modal values all range from 51dB L_{A90} to 52dB L_{A90}. From review of the graph in Figure 1, 51dB L_{A90} has been considered as representative of the typical background sound level during the daytime period.

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



4.5. In order to be robust and from review of the graph in Appendix C, 47dB L_{A90} has been considered as representative of the existing background sound pressure level during the night-time period.

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

- 51dB L_{90} during the daytime period; and
- 47dB L_{90} during the night-time period

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 noise thresholds within Appendix 3 of the Local Plan and to refers 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.*

5.7. Plant selections are not tonal and it is therefore considered appropriate to exclude the 5dB additional penalty described in the notes to Table C.

Typical Council Condition

5.8. In addition to the above guidance, NSL understand that the London Borough of Camden typically impose the following condition on grocery sites such as this:

> *"Noise levels at a point 1 metre external to sensitive facades shall be at least 10dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 15dB(A) below the LA90, expressed in dB(A).*

Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies G1, CC1, D1, A1 and A4 of the London Borough of Camden Local Plan 2017."

BS 4142:2014 'Methods for Rating and Measuring Industrial and Commercial Sound'

5.9. British Standard (BS) 4142:2014 describes a method for rating and assessing sound of an industrial or commercial nature, which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

5.10. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.

5.11. The procedure contained in BS 4142 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.

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 background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: *"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."*

5.16. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

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 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.

National Planning Policy Framework

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

5.21. Paragraph 170 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."*

5.22. The NPPF goes on to state in Paragraph 180:

"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 ...

5.23. The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

5.24. 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."

5.25. 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."

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

5.26. Paragraph 117 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.

Proposed criteria

5.27. It is considered appropriate that the cumulative noise level of proposed plant should be controlled to a level at least 10dB below the representative L_{A90} background sound level at the nearest noise-sensitive property.

5.28. The cumulative noise level for the proposed plant at the nearest hotel windows should not therefore exceed the limits shown in the table below:

Table 3 Proposed plant noise emissions level limits at noise sensitive residential receptors

Period	Cumulative plant noise level, dB(A)
Daytime (07.00 – 23.00 hours)	41
Night-time (23.00 – 07.00 hours)	37

6.0 Plant noise assessment

6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted. The assessment has taken into consideration distance attenuation and directivity corrections.

6.2. The predictions during the daytime period have been based on the proposed AC and refrigeration plant operating at full capacity. During the night-time period the AC will operate with the refrigeration plant on a lower duty.

6.3. Table 4, below, summarises the results of the assessment at 1 metre from 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 4 Assessment of predicted noise levels at nearby receptors

Receptor	Period	Predicted plant noise level at receptor, L_{Aeq} (dB)	Proposed design criterion (dB)	Difference (dB)
R1	Daytime (07.00 – 23.00 hours)	33	41	-8
	Night-time (23:00 – 07:00 hours)	32	37	-5

6.4. The above assessment demonstrates that noise from the proposed plant will comply with the criteria in Table 3 without the need for mitigation measures.

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 hotel window. 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 capacity, as this is not always the case, 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 by Space Engineering Services to undertake a noise impact assessment for new plant serving the existing Tesco Express store at 124 Tottenham Court Road in Bloomsbury.

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 plant area.

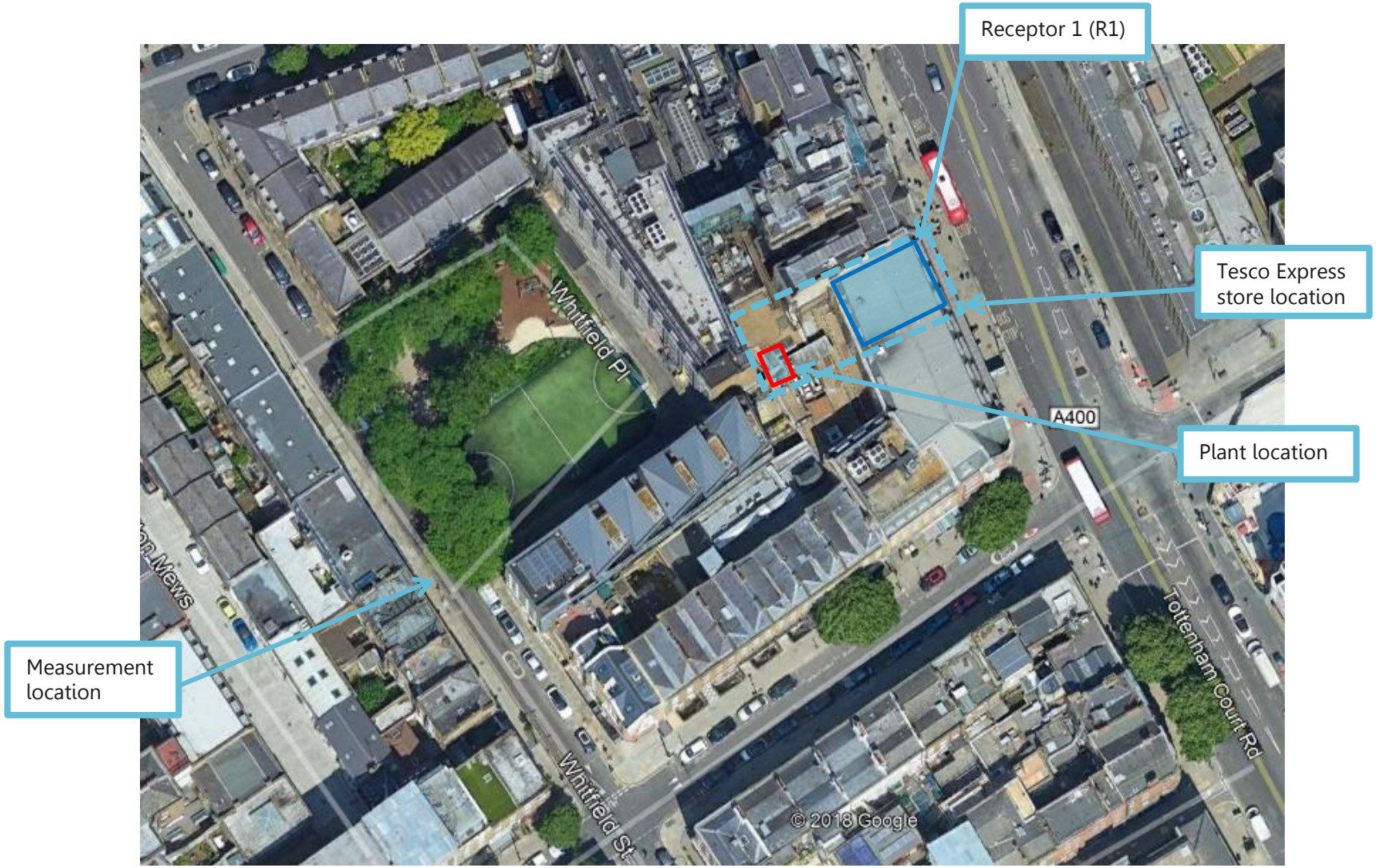
7.3. The predictions demonstrate that cumulative noise from the proposed plant meets the proposed noise criteria at all nearby receptors and at all times, without the need of mitigation measures.

7.4. 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 of site showing areas of interest



Photograph 1 Courtesy of Google Earth


Receptor 1 (R1)
Proposed AC location
Location of replacement gas cooler

Appendix C Plant information and manufacturer published sound pressure levels

Plant item	Make/Model	Quantity	Period	Sound Pressure Level	
				dBA	Distance (m)
Air Conditioner (Sales floor)	Daikin / AZAS140MV1	3	Daytime period (07:00 – 23:00 hours)	44*	1
			Night-time period (23:00 – 07:00 hours)	44*	1
Air Conditioner (Cash office)	Daikin / RZAG35A	1	Daytime period (07:00 – 23:00 hours)	48	1
			Night-time period (23:00 – 07:00 hours)	48	1
Gas Cooler	Kelvion / GF-SJ02F6H	1	Daytime period (07:00 – 23:00 hours)	27	10
			Night-time period (23:00 – 07:00 hours)	19	10

**Note 1: The sales floor AC units have a maximum noise emission of 57dB at 1m; these units have been installed with a limiter to always run on the night-time setback "quiet mode".*

Appendix D Environmental sound survey

Details of environmental sound surveys

D.1 Measurements of the existing background sound levels were undertaken from 16.00 hours on Thursday 17th October to 15.00 hours on Friday 18th October 2019.

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

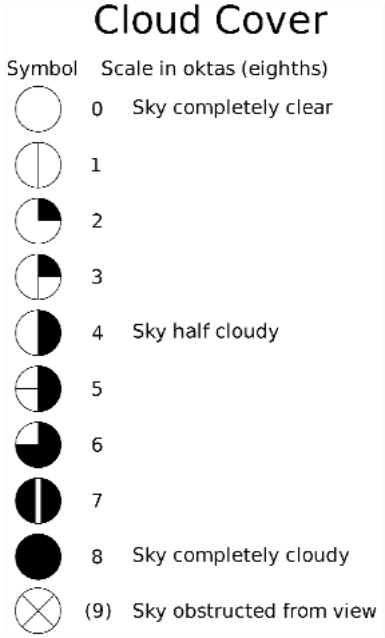
D.3 The representative measurement position was located on a lamppost along Whitfield Street outside number 133 (location indicated on the site plan in Appendix B). In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

Equipment

D.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 (+/-0.2 dB) in the calibration level was noted.

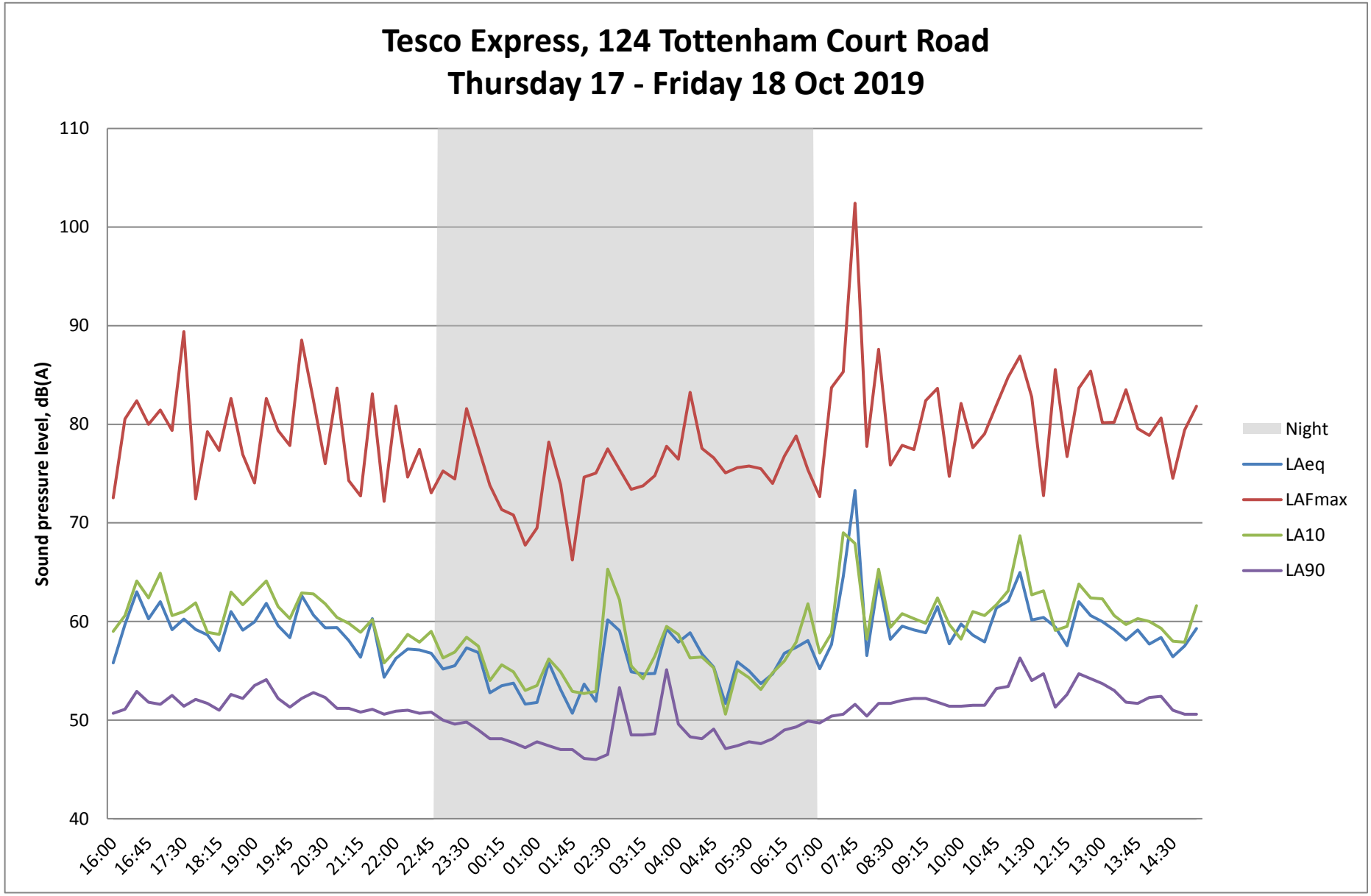
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977 / 36190	06/07/2018	15444
Condenser microphone	ACO Pacific 7052E / 57366		
Preamplifier	Svantek SV12L / 41504		
Calibrator	CEL 284/2 /4/03326334	24/05/2019	TCRT19/1408

D.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	16.00 17/10/2019 – 15.00 18/10/2019	Temperature (°C)	11	14
		Precipitation:	No	Yes
		Cloud cover (oktas – see guide)	5	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Yes	Damp
		Wind Speed (m/s)	1	2
		Wind Direction	West	West
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.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 at the measurement position was dominated by local and distant road traffic. The results of the survey are presented in a time history graph overleaf.


Tesco Express, 124 Tottenham Court Road
Thursday 17 - Friday 18 Oct 2019
Sound pressure level, dB(A)
110
100
90
80
70
60
50
40
16:00
16:45
17:30
18:15
19:00
19:45
20:30
21:15
22:00
22:45
23:30
00:15
01:00
01:45
02:30
03:15
04:00
04:45
05:30
06:15
07:00
07:45
08:30
09:15
10:00
10:45
11:30
12:15
13:00
13:45
14:30
Night
LAeq
LAFmax
LA10
LA90

Appendix E Noise level predictions

Receptor R1, Day-time period

Plant item	Manufacturer noise data		Distance correction		Directivity correction (dB)	Screening correction (dB)	Resultant at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Correction (dB)			
AC sales 1	44	1	8	-18	0	0	26
AC sales 2	44	1	11	-21	0	0	23
AC sales 3	44	1	10	-20	0	0	24
AC cash 1	48	1	10	-20	0	0	28
Gas Cooler	27	10	12	-2	0	0	25
						Cumulative (dB)	33

Receptor R1, Night-time period

Plant item	Manufacturer noise data		Distance correction		Directivity correction (dB)	Screening correction (dB)	Resultant at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Correction (dB)			
AC sales 1	44	1	8	-18	0	0	26
AC sales 2	44	1	11	-21	0	0	23
AC sales 3	44	1	10	-20	0	0	24
AC cash 1	48	1	10	-20	0	0	28
Gas Cooler	19	10	12	-2	0	0	17
						Cumulative (dB)	32

Appendix F Plant layout