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PLANNING NOISE ASSESSMENT

PLOT E, THE QUADRANT

BOSTON

LINCOLNSHIRE

Client: Sigma Property Co. Ltd

Report author: .....
David Degos
Senior Consultant

Approved by: .....
Paul Cockram
Associate

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THE GREEN BUSINESS CENTRE
THE CAUSEWAY
STAINES
MIDDLESEX
TW18 3AL

TELEPHONE: 01784 464404
FACSIMILE: 01784 465447
E MAIL: mail@aad.co.uk

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1.0 Introduction

1.1 Applied Acoustic Design (AAD) have been commissioned to undertake a planning noise assessment of the proposed Plot E site, which forms part of The Quadrant development in Boston, Lincolnshire. A Self-storage unit is proposed.

1.2 A noise survey has been carried out at site to determine prevailing ambient and background noise levels.

1.3 Noise levels from future activity noise have been assessed at the nearest noise sensitive receivers. No fixed plant is associated with the development

2.0 Site Description

2.1 Plot E is currently vacant land located in the northern area of the Quadrant development site.

2.2 Plot E is adjacent to the A16, with existing residential estates to the north and west. A newly built hotel occupies the majority of The Quadrant site, to the south side of Plot E. A Self storage unit is proposed as part of the Plot E scheme.

2.3 An aerial view of the site is presented in Appendix 1.

3.0 Site Noise Survey

3.1 Instrumentation: An NTi Audio XL2 Type 1 sound level meter (Serial No. A2A 08108) with associated pre-amplifier and microphone. The instrument was checked for correct calibration prior and subsequent to use with a Larson Davis type CA 250 calibrator whereupon no calibration drift was recorded. The instrument was used in accordance with the manufacturer's instructions.

3.2 Location: The sound level meter was mounted on a tripod approximately 1.5m from the local ground. See Appendix 1 for the measurement location. This location is also considered to be representative of background noise levels at the nearest noise sensitive receivers which are housing to the north and west.

3.3 Periods: Noise level monitoring was undertaken between approximately 14:30 hrs on Tuesday 12th February 2019 until 14:00 hrs on Thursday 14th February 2019. The monitor was configured to log noise levels continuously in 15 minute and 1-minute intervals.

3.4 Weather: The weather conditions prevailing during the survey period were overcast and dry. Wind speed was understood to be less than 5 m/s throughout the survey period, based upon local historical weather data.

3.5 Site Noise Characteristics: The ambient noise climate is controlled by noise from road traffic on the surrounding roads. It is understood that no unusual events occurred during the survey period.

3.6 Surveyor: Alec Higgins AMIOA

3.7 Results: The results of the measurements are summarised in Table 1 below, showing the recorded values of background and ambient noise (L_{A90} and L_{Aeq} dB). Refer to Appendix 1 for the measurement location and Appendix 2 for the survey measurement data in graphical form.

Table 1: Typical Background Noise Measurement Results $L_{A90,T}$ dB

Measurement Parameter	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Typical Background Noise Level	42 dB $L_{A90\ (15min)}$	31 dB $L_{A90\ (15min)}$

Table 2: Average Ambient Noise Measurement Results $L_{Aeq,T}$ dB

Measurement Parameter	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Average Ambient Noise Level	63 dB $L_{Aeq\ (15min)}$	59 dB $L_{Aeq\ (15min)}$

3.8 A glossary of acoustic terminology is included in Appendix 5.

4.0 Activity Sound Criteria

4.1 The following activities have been taken into account as part of the self-storage unit activity sound assessment:

- Loading/unloading activities
- General vehicle movement including car parking for the Self storage unit

4.2 In order to quantify potential sound impact, this assessment of sound from the activities described above will use the criteria provided by the Guidelines for Environmental Noise Impact Assessment published by the Institute of Environmental Management & Assessment. This guide contains a scheme for assessing the likely impact on amenity of sound from a development proposal. Although the guide is mostly concerned with the impact of major infrastructure development, inference can be taken from the assessment procedure for other sources of sound.

4.3 The scheme considers the difference between the existing and new sound sources, any increases in sound levels due to the development proposal and if there are a greater number of sound events. An assessment of the effect on residential amenity should consider if there is likely to be any increase in sound levels.

4.4 The guidelines set out example categories of sound impact based on the likely change in sound levels due to a development proposal. The example impact categories are as set out below.

Table 3: IEMA Noise Impact Effect Descriptors

Impact Effect Descriptor	Change in Noise Level
Very Substantial	Greater than 10dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5dB L_{Aeq} change in sound level at a noise sensitive receptor, or 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise

Moderate	A 3 to 4.9dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not significant	A less than 2.9dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

4.5 Typical ambient sound levels have been measured at the survey location illustrated in Appendix 1, this is close to the A16 that runs adjacent to the site. Road Traffic is considered to be the main source of sound at site and at nearby noise sensitive housing. Therefore, sound levels measured at the survey location have been corrected to account for distance attenuation using the methodology presented in Control of Road Traffic Noise (CRTN) to determine sound levels at the housing. These are presented below and include a correction of -6 dB for distance attenuation to both the daytime and night-time sound levels.

Table 4: Predicted Average Ambient Noise Levels $L_{Aeq,T}$ at Nearest Receiver dB

Measurement Parameter	**Daytime (07:00-23:00)**	**Night-time (23:00-07:00)**
Overall Average Predicted Ambient Noise Level at the Nearest Noise Sensitive Receiver	58 dB $L_{Aeq\ (15min)}$	54 dB $L_{Aeq\ (15min)}$

4.6 The ambient noise levels presented above will be used to compare the self-storage unit activity sound against to determine its impact on nearby housing.

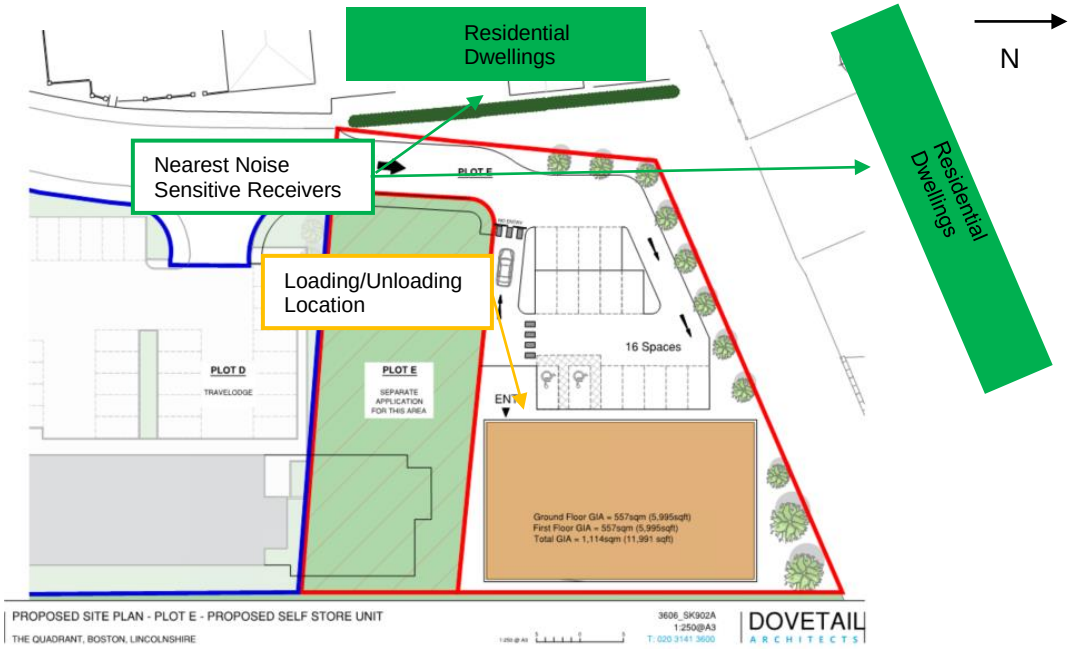
5.0 Activity Sound Impact Assessment

5.1 A SoundPLAN 8.2 noise model of the site has been created using both AAD database sound source measurements presented in Table 5 and traffic count data as provided by Dovetail Architects. The traffic count data are presented in Appendix 3.

5.2 Loading/Unloading Sound

5.2.1 The Self-storage unit will have regular loading/unloading activities as part of its operation. These will take place to the west of the self-storage unit at the main entrance as indicated in the figure below.

Figure 1: Loading/Unloading Activity Location



5.2.2 Loading/unloading activities are assumed to be typically 30 minutes in duration and are understood to occur during the 05:00-23:00hrs period.

5.2.3 Sound levels for loading/unloading are based upon data in Table 5, which are measurements completed by AAD for a typical commercial vehicle. The measurements were completed at a distance of 4m from an articulated truck being unloaded. Although the vehicles associated with the self-storage unit activity will be cars and small vans only, this should provide a worst-case assessment.

Table 5: Loading/Unloading Sound Pressure Levels at 4m

Source	Octave Band Centre Frequency							dBA
	63	125	250	500	1k	2k	4k	
	Sound Pressure Level in dB re 2 x10^{-5} Pa							
Average Delivery Sound Level L_{Aeq}	71	69	68	65	59	53	49	66

5.2.4 Levels of loading/unloading activity sound likely to arise at the nearest residential properties have been calculated using the SoundPLAN model noted in section 5.1. The results of calculations are summarised in the table below.

Table 6: Loading/Unloading Sound Level Predictions at Nearest Noise Sensitive Receivers

Receiver Location	Loading/Unloading Sound Levels from-Self storage Unit L_{AeqT} – Daytime Period (07:00-23:00)	Loading/Unloading Sound Levels from Self-storage Unit L_{AeqT} – Night-time Period (23:00-07:00)
Nearest Noise Sensitive Properties – north and west of site	50 dB	50 dB

5.3 General Site Vehicle Movement and Car Parking Sound

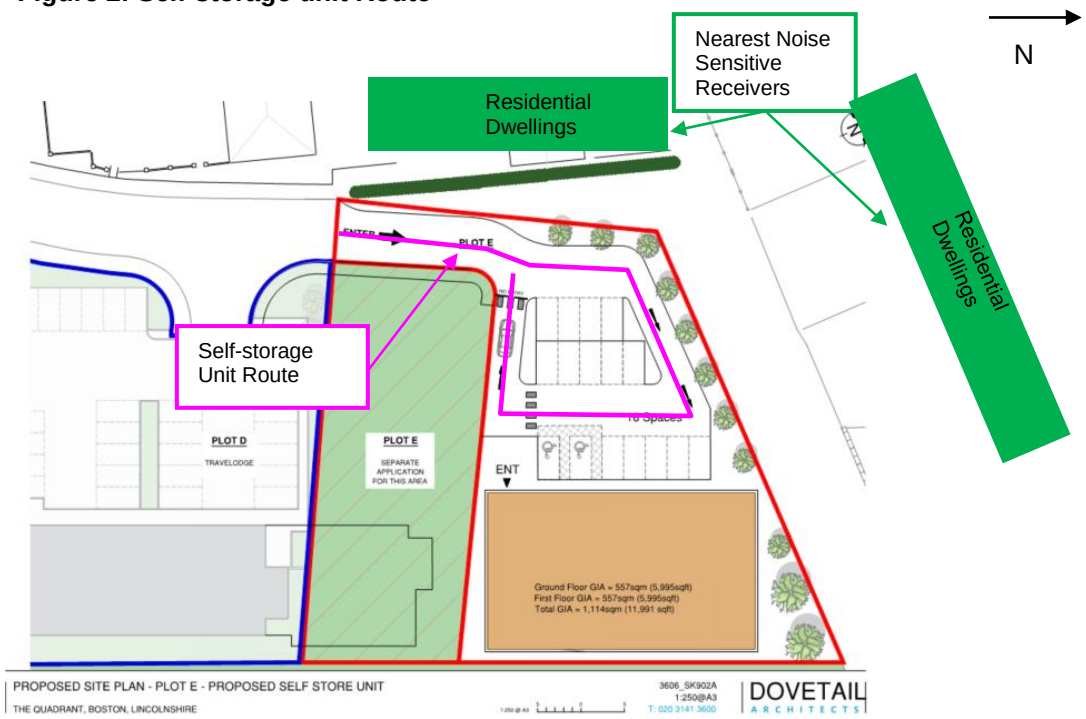
5.3.1 The Self-storage unit will operate between 05:00 and 23:00hrs. Data on numbers of vehicles likely to use the Self-storage unit throughout its opening hours have been provided by Dovetail Architects and is presented in Appendix 3. This shows the total number of vehicles for the daytime (07:00-23:00) and night-time (23:00-07:00) periods; the data are for customers using the self-storage unit.

5.3.2 The sound impact of vehicle movements to the Self-storage unit has been assessed in-terms of one-hour periods during daytime and night-time. The worst-case daytime traffic flow is for 27 vehicle movements. There are 16 car park spaces proposed so as a worst-case it has been assumed that 16 vehicle movements will occur and 16 car park spaces will be occupied within the same hour for the daytime period. It is understood that only one vehicle movement is predicted for the night-time period.

- Daytime, worst -case assumption from 08.00 to 09.00 – 16 vehicle movements
- Night-time, worst -case assumption from 06.00 to 07.00 – 1 vehicle movement

5.3.3 Calculation of vehicle movement sound associated with the self-storage unit has been completed using the SoundPLAN model noted in Section 5.1. To account for the influence of the access lane, a line source was created in the model as indicated in Figure 2 below. The carpark has been modelled as an area source which is assumed to be fully occupied during the daytime period (16 car parking spaces) and partially occupied during the night-time period (1 car parking space).

Figure 2: Self-storage unit Route



5.3.4 Results of the sound modelling exercise are presented in the table below

Table 7: Vehicle and Car Park Sound Level Predictions at Nearest Receivers

Receiver Location	**Total Self-storage Unit Vehicle Movement Sound Level $L_{Aeq,T}$**	
	Daytime Period (07:00-23:00)	**Night-time Period (23:00-07:00)**
Nearest Noise Sensitive Properties – north and west of site	56 dB	50 dB

5.4 Total Activity Sound Summary

5.4.1 Sound level predictions presented above have been combined for both the daytime and night-time periods. The overall sound level predictions include sound levels from Self storage unit loading/unloading activities and general vehicle movements. The table below presents a summary of these sound levels. Grid sound maps showing the overall activity sound levels for both the daytime and night-time periods are presented in Appendix 4.

Table 8: Predicted Combined Activity Sound Levels $L_{Aeq,T}$ at Nearest Receiver dB

Site Activity	Predicted Sound Levels at Nearest Noise Sensitive Receiver L_{AeqT}	
	Daytime (07:00-23:00)	**Night-time (23:00-07:00)**
Loading/Unloading Activities	50 dB	50 dB
General Vehicle Movements	56 dB	50 dB
Total Combined Activity Sound Levels L_{AeqT}	**57 dB**	**53 dB**

5.4.2 Results presented above show total worst-case activity sound levels at the nearest sound sensitive receivers of 57 dB L_{Aeq} for the daytime period and 53 dB L_{Aeq} for the night-time period. The impact of these sound levels on noise sensitive housing is shown in Table 9 below.

Table 9: Assessment of Self-storage Unit Sound Impact

Notes	Sound Level at Nearest Noise Sensitive Receivers, $L_{Aeq,T}$	
	Daytime (07:00-23:00)	**Night-time (23:00-07:00)**
Self-storage unit Activity Sound Level	57 dB	53 dB
Existing Ambient Sound Level	58 dB	54 dB
Self-storage unit and Existing Sound Level Combined	60.5 dB	56.5 dB
Change in Existing Ambient Sound Level	+ 2.5 dB	+ 2.5 dB
Impact Effect Description	None/not significant	None/not significant

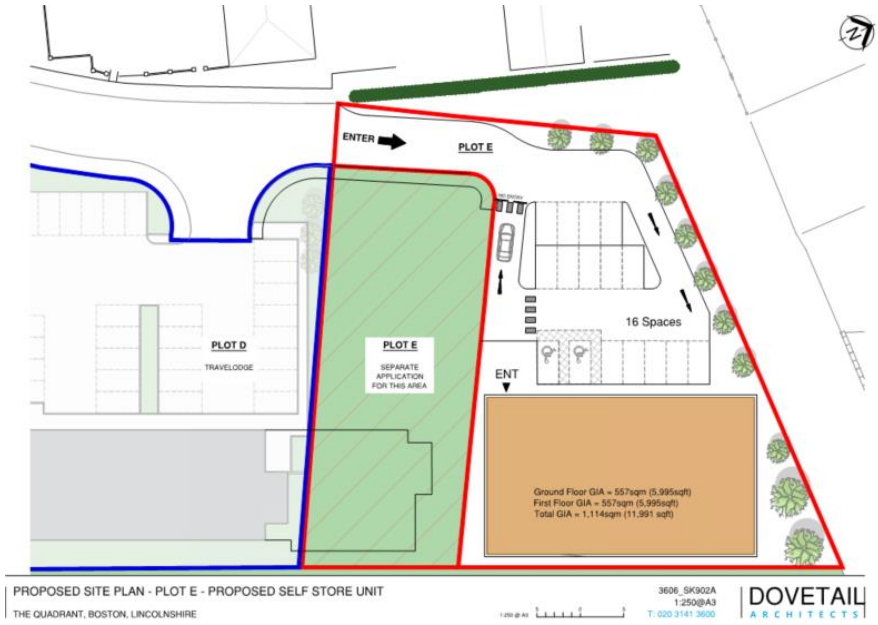
5.4.3 The assessment set out in Table 9 shows the impact of self-storage unit activity sound on nearby noise sensitive housing as being 'none/not significant'. Therefore, the proposed scheme should be suitable for its intended use.

6.0 Conclusion

6.1 Prevailing background sound levels have been established by a sound survey at and around the proposed Plot E site as part of The Quadrant development in Boston, Lincolnshire.

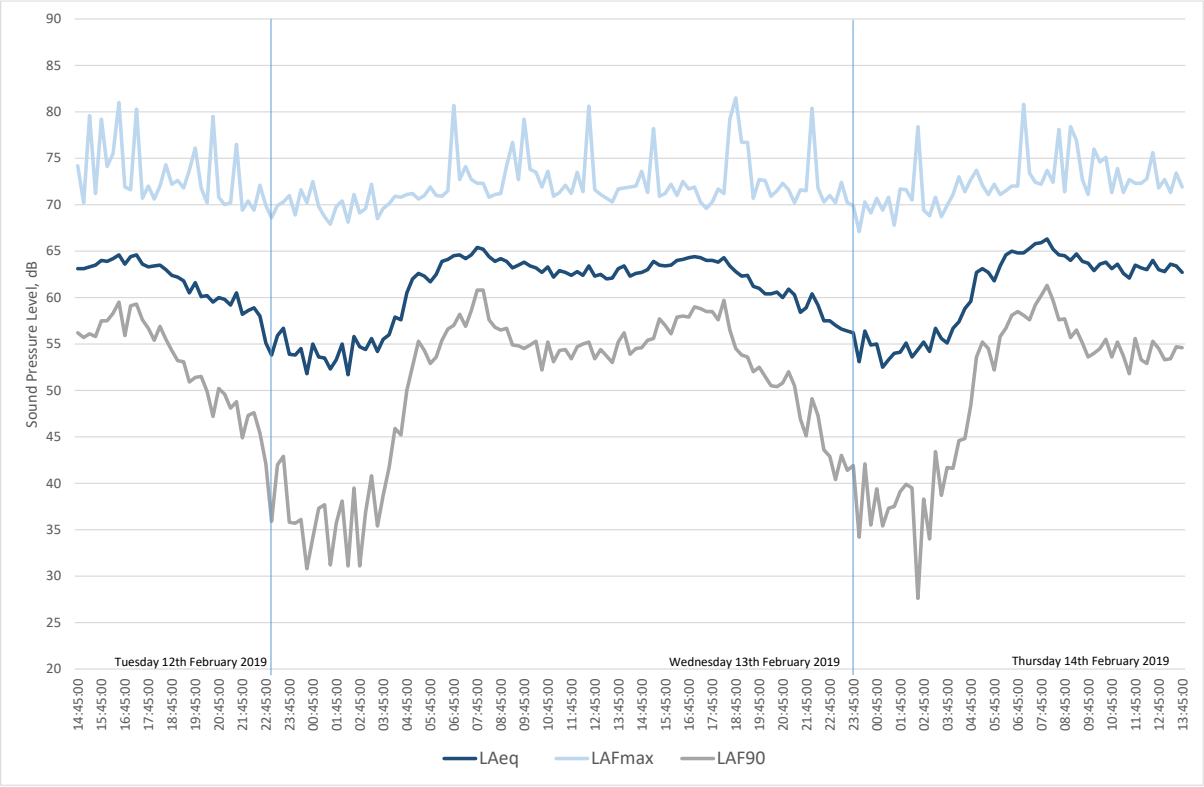
6.2 Sound modelling predictions for activity associated with a proposed self-storage unit have been carried out. The sound impact arising from the self-storage unit at the nearest residential properties is likely to be **'None/Not Significant'** when assessed with regard to guidelines set out in 'Guidelines for Environmental Noise Impact Assessment' published by the Institute of Environmental Management & Assessment. Therefore, sound from the proposed development is unlikely to detrimentally impact nearby noise sensitive dwellings.

Appendix 1: Site Plan

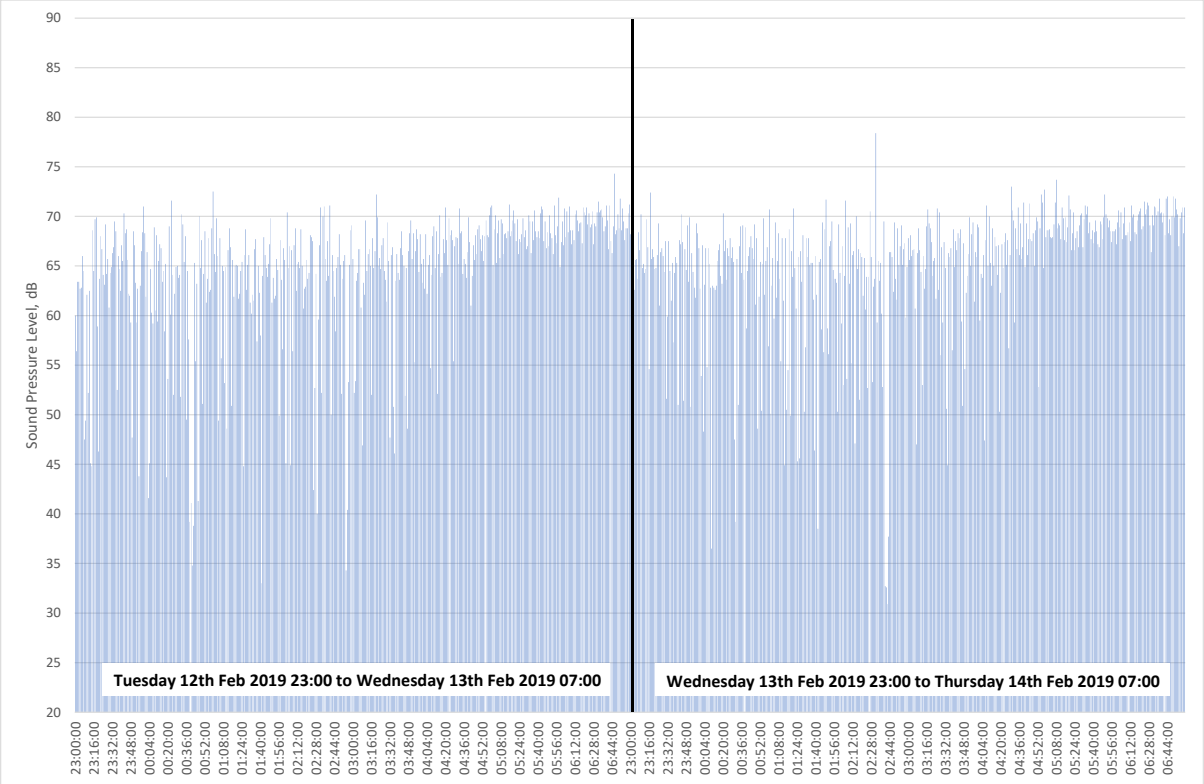


Appendix 2: Sound Survey Data

A) Sound Survey Data - 15 minute Intervals



B) Sound Survey Data – Night Time L_{AMax}, 1 minute Intervals

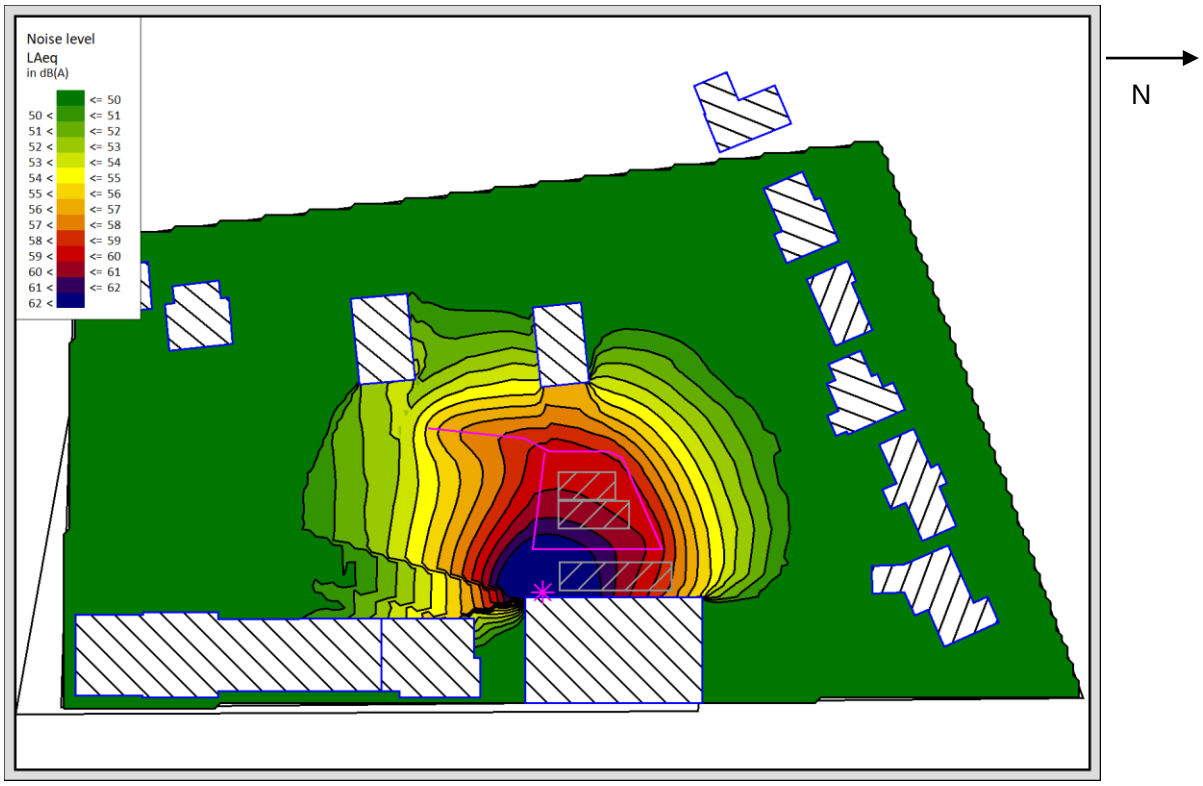


Appendix 3: Traffic Count Data

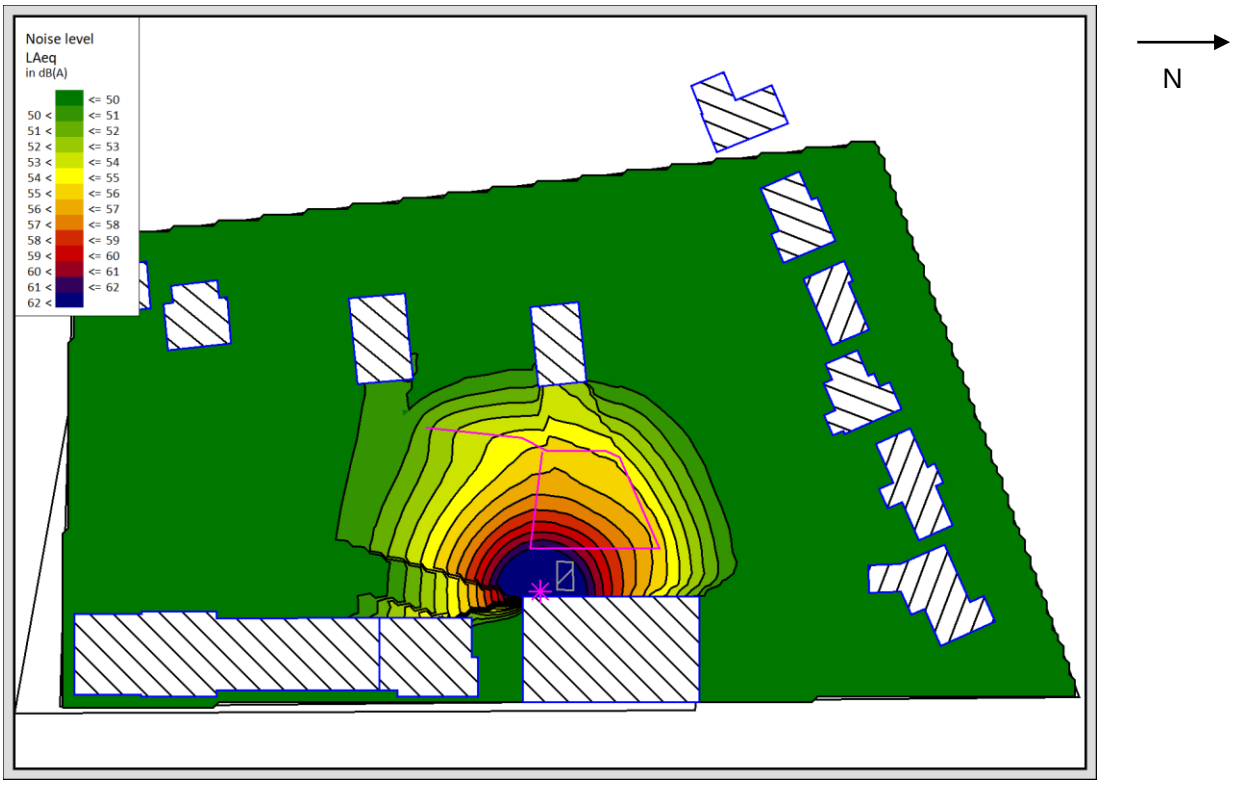
	Date	Number of day customers 07:00 - 23:00	Number of night customers 23:00-07:00
Monday	01/06/2021	24	1
Tuesday	02/06/2021	27	1
Wednesday	03/06/2021	22	0
Thursday	04/06/2021	20	0
Friday	05/06/2021	24	0
Saturday	06/06/2021	24	0
Sunday	07/06/2021	27	1
Monday	08/06/2021	21	1
Tuesday	09/06/2021	22	1
Wednesday	10/06/2021	22	0
Thursday	11/06/2021	23	1
Friday	12/06/2021	24	0
Saturday	13/06/2021	27	0
Sunday	14/06/2021	23	0

Appendix 4: Grid Sound Map Results – Restaurant Activity Sound

4.1 Daytime Grid Sound Map – All Storage Unit Activities - Grid Resolution 1m, Grid Height 4.5m



4.2 Night-time Grid Sound Map – All Storage Unit Activities - Grid Resolution 1m, Grid Height 4.5m



Appendix 5: Glossary of Terms.

Term	Description	Explanation
	Noise	Unwanted sound. In the explanation given below the words 'sound' and 'noise' can often be used interchangeably, depending on context.
dB	The decibel scale	The decibel (or dB) scale is the scale on which sound pressure levels are commonly measured. It is a logarithmic scale and is used for convenience to compress the audible range of sound pressures into a manageable range, from 0 dB to 140 dB. The zero of the scale, 0 dB, corresponds to the threshold of hearing, 0.00002 Pa, and the upper limit, 140 dB, corresponds to 20 Pa, the threshold of pain.
	Sound pressure	Sound is a disturbance or fluctuation in air pressure, and sound pressure, measured in pascals (Pa), is used as a measure of the magnitude of the sound. The human ear can detect sound pressures in the range from 0.00002 Pa to 20 Pa. This is an enormously wide range and so for convenience sound pressures are commonly measured on a decibel (dB) scale.
Lp	Sound pressure level	Instantaneous value of Sound Pressure Level (Lp).
	Sound power	The sound energy radiated per unit time by a sound source, measured in watts (W)
L_W	Sound power level	Sound power measured on a decibel scale: $L_W = 10\log(W/W_0)$, where W_0 is the reference value of sound power, 10^{-12} W.
f	Frequency	The frequency of a musical note is what gives it its pitch. It is the number of cycles of the fluctuating sound pressure which occur each second, and is measured in cycles per second, or Hertz (Hz). The human ear can detect frequencies in the range 20 to 20 000 Hz. Most sounds and noises are a mixture of all frequencies, called broad-band noise.
	Octave bands Octave band spectra	In order investigate the frequency content of broad band sounds, called its frequency spectrum, measurements of sound pressure are carried out over a range of frequency bands. The most common method is to split the audio frequency range into 8 or 9 octave bands. An octave is a frequency range from one particular frequency to double that frequency.
	Free-field	A free field sound level measurement is one which is unaffected by the presence of any sound reflecting surfaces. In an outdoor situation this is usually taken to mean with no sound reflecting surfaces within 3 m. of the source.
	Facade correction Factor	The difference between the façade level and the free field level (in the absence of the façade) is called the façade correction factor.
A	A-weighting	One of the three frequency weightings (A, C and Z) used in sound level meters, and defined in BS EN ISO 61672-1; a very widely used method of producing a single figure measure of a broad band noise which takes into account, in an approximate way at least, the frequency response of the human hearing system. The idea is that sound levels measured in this way should give an indication of the loudness of the sound.
Z	Z-weighting	One of the frequency weightings defined in BS EN ISO 61672-1; 'Z' stands for zero and the Z weighting correspond to a 0 dB weighting at all frequencies. Previously known as 'linear'.
f	Time weighting, fast	An averaging time used in sound level meters, and defined in BS EN ISO 61672-1.
s	Time weighting, slow	An averaging time used in sound level meters, and defined in BS EN ISO 61672-1.
L_A (dBA)	A- weighted sound pressure level	The value of the sound pressure level, in decibels, measured using an A-weighting electronic circuit built into the sound level meter. The vast majority of noise measurements are carried out in this way.
$L_{Aeq,T}$	Equivalent continuous sound level	It represents a measure of the 'average' sound level over the measurement period. It corresponds to the steady level of sound

		which, over the same period of time, T, would contain the same amount of (A-weighted) sound energy as the time varying noise. Also known as the Average sound level. This is the most common method of measuring time varying noise, and within certain limits gives the best correlation with human response to noise, for example with annoyance.
$L_{AN,T}$	Statistical percentile noise levels	$L_{AN,T}$ is the noise level, usually A-weighted, which is exceeded for N% of the measurement period, T. The most commonly used values are $L_{A10,T}$ used for the measurement and assessment of traffic noise, and $L_{A90,T}$, commonly used as a measure of background noise. $L_{A1,T}$ and $L_{A99,T}$ are also occasionally used to give an indication of the highest and lowest noise levels occurring during the measurement time interval.
	Background noise	Ambient noise which remains at a given site when occasional and transient bursts of higher level ambient noise levels have subsided to typically low levels; it is the noise normally present for most of the time at a given site. It is usually described by the L_{A90} value.
$L_{A90,T}$	Background noise level	Defined in BS 4142 as the value of the A-weighted residual noise at the assessment position that is exceeded for 90 % of a given time interval, T, (i.e. $L_{A90,T)}$ measured using time weighting, F, and quoted to the nearest whole number of decibels. (Also see under residual noise). Background noise itself often varies with time and so the $L_{A90,T}$ is almost universally used as the best measure of the 'more or less always present' noise level which underlies short term variations from other sources of noise.
	Specific Noise Source	The noise source under consideration when assessing the likelihood of adverse impact using BS4142:2014.
	Specific Noise Level	The value of $L_{Aeq,T}$ at the assessment position produced by the specific noise source, ref. BS4142:2014.
$L_{ar,Tr}$	Rating Level	The specific noise level, corrected to account for any characteristic features of the noise, by adding a rating penalty for any tonal, impulsive or irregular qualities, ref. BS4142:2014.
T_r	Reference time interval	Specified interval over which the specific sound level is determined, ref. BS4142:2014.
	Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, ref. BS4142:2014.
$L_r = L_{Aeq,T}$	Residual Sound Level	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T, ref. BS4142:2014.