Acoustic Associates Sussex Ltd

BS4142:2014-A1:2019 Noise Survey & Assessment

Site: **52 - 60 Dolphin Road, Shoreham by Sea**
Client: **Higgidy Kitchen**

Report by: Simon Barrett BSc(Hons) MSc MIOA

Date: 03/03/2022
Project: J3324

Acoustic Associates Sussex Ltd.

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Sound Insulation Testing - Acoustic Design of Buildings - BS4142 - PPG24 - Schools Acoustics BB93 - Vibration - Expert Witness Testimony - Noise at Work - Air Tightness Testing - Auditorium Acoustics

Acoustic Associates Sussex Ltd., 8 Highdown House, Shoreham Airport, Shoreham-by-Sea, West Sussex BN43 5PB
Tel: (01273) 455074 Fax: (01273) 455075 e-mail: info@aasussex.co.uk **www.aasussex.co.uk**

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Report by: Simon Barrett BSc(Hons) MSc MIOA
Checked by: Peter Attwood BSc MSc MCIOB MIOA

Issue 1	03/03/2022

1 Introduction & Executive Summary

Acoustic Associates Sussex have been appointed to undertake a noise assessment in support of the installation of new plant relating to an extension to the Higgidy Kitchen premises at 52 - 60 Dolphin Road, Shoreham by Sea, BN43 6QG.

The purpose of this assessment is to assess the following:

- The impact of commercial sound levels from the proposed plant at the nearest noise sensitive receptors (NSRs).
- Provide mitigation measures (if necessary)

The existing L_{90} Background Sound Level has been measured on the existing site and at the nearest NSR locations nearby.

The sound pressure levels for the day and the night-time periods have been assessed in terms of and following the guidelines of the documents listed below:

- BS4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound
- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- National Planning Policy Framework NPPF 2021

The results show that the Rating Level due to new proposed plant would be significantly below the existing L_{90} background sound level at the nearest NSRs and as such adverse impact will be very unlikely.

For this reason, planning consent should not be withheld on noise grounds.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Site Description

The site – 56 - 60 Dolphin Road - is the current and long-standing food production premises of Higgidy Kitchen. The site is situated on a mature industrial estate; other existing commercial spaces exist along this road and Higgidy is situated west of PyroBan and East of a vehicle parts manufacturer. The new proposed plant is to be located to the east of the existing Higgidy Building on a flat grassy area. Additional manufacturing facilities are to be built within units 52 – 55.

The figures below, as provided by the client, outlines the proposed extension.



Figure 1: Outline of Extension - Drawing 1

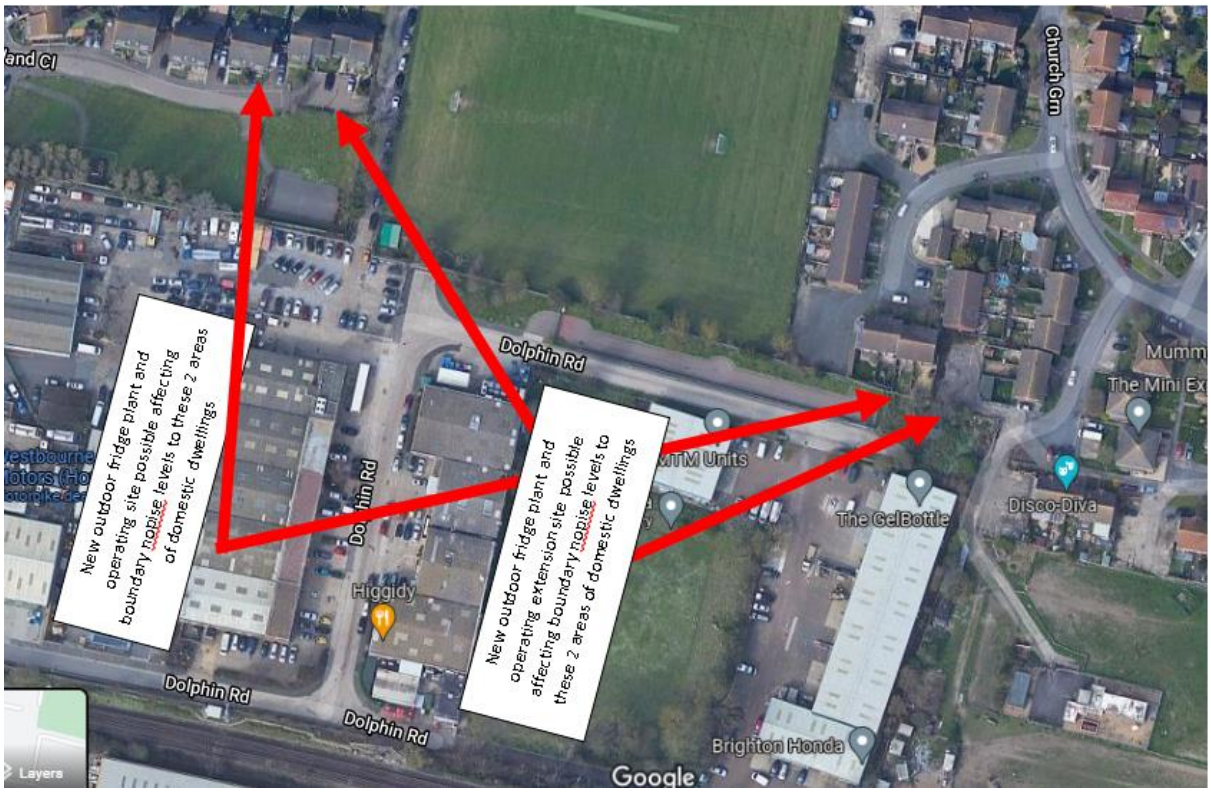


Figure 2: Outline of Extension - Drawing 2

It is proposed that there will be a mixture of new ground level and roof-top mounted plant for chillers and an air handling unit. Details of the proposed plant locations can be found in the appendices of this report.

3 Standards and Guidance

3.1 National Planning Policy Framework NPPF July 2021

The National Planning Policy Framework (July 2021) defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so.

The following paragraphs are relevant within NPPF Section 15 (Conserving and enhancing the natural environment) states the following:

Paragraph 174(e) - Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; an

Paragraph 185 - Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the 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; an

Paragraph 187 – Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

3.2 BS4142: 2014: Methods for rating and assessing industrial and commercial sound

This document provides a means of assessing the impact of industrial or commercial sound upon nearby noise-sensitive receptors, including residential properties.

It does this by comparing the Rating Level of the noise from the industrial or commercial source with the pre-existent L_{90} background noise level affecting the same noise-sensitive premises. The Standard provides guidance that:

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

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

c) A difference of around +5dB 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 noise level, this is an indication of the specific sound source having a low impact, depending on the context.

3.3 Methodology and Approach

To ensure that sufficient information is presented to accompany the planning application, the following approach was applied:

1. Visit the commercial premises and measure background sound levels as close as possible to the nearest noise sensitive residential receptor (NSR) whilst being at a secure location.
2. Visit other nearby areas closer to the nearest NSRs and carry out short-term manned measurements whilst the long-term measurement is still in place and logging noise data.
3. Extract information from the measured dataset which shows the representative background sound pressure levels for periods when the plant will operate
4. Obtain sound power and sound pressure level data of all the plant to be installed at the site along with the installation location information.
5. Create a computer noise model, using the Immi (Wolfel) noise modelling software, of the plant, showing its predicted propagation across the nearby terrain and toward the nearest NSRs.
6. A BS4142:2014-A1:2019 assessment will then be carried out using the worst case predicted results.
7. Context and uncertainty will be discussed in line with BS4142:2014-A1:2019
8. Mitigation Measures, if required, will be discussed and the report concluded.

4 Noise Survey Baseline Conditions and Results

A background noise survey was carried out between 11 Jan 2022 and 21 Jan 2022 to assess the background sound pressure levels at the site. On two occasions, whilst the long term survey was still in progress, short term manned measurements were carried out at locations nearer to the nearest NSRs at Church Green, Shoreham and at Kingsland Close, Shoreham in order to find the difference between the measurement location and those closer to the residences (it was not possible to install long-term un-manned survey equipment closer to the nearest NSRs from an equipment security perspective and this is the accepted method previously used in 2015 for this client). Measurements were all carried out in free-field conditions.

4.1 Background and Existing Noise Survey Details

Survey(s) carried out by	Simon Barrett BSc(Hons) MSc MIOA
Equipment Used (Long Term)	Svantek 971 “Moles” - Class 1 Sound Level Meter – Serial No. 96147 (Unattended)
Equipment Used (Long Term)	01dB Cal 21 Acoustic Calibrator – Serial No. 50241778(2004)
Location (Long Term)	Pole Mounted above fence line at 2m from ground
Duration (Long Term)	11 January 2022 and 21 January 2022
Equipment Used (Short Term)	Norsonic Nor 118 (Serial No.) and Tripod
Locations (Short Term)	Short Term 1 (ST1): Church Green Short Term 2 (ST2): Kingsland Close
Duration (Short Term)	1 hour per measurement on visit 1 in each location (19/01/2022) ½ hour per measurement on visit 2 in each location (21/01/2022)

Table 1. Survey Equipment

The sound level meter was calibrated before and after commencing the noise measurements (@114dB with no drift). All long-term measurements were taken with the time base set to 15-minute interval periods. The unattended sound level meter can be seen in the figure below.



Figure 3: Long-Term Background Sound Survey Location

N.B. An image of the long-term survey location and the two short term survey locations can be found in the appendices of this report.

4.2 Background Sound Survey Results

The existing Background Sound Level data has been processed to show the most representative sound level for the area for the daytime and night time periods (07:00-23:00hrs and 23:00-07:00hrs respectively).

The representative Background Sound Level at the long-term measurement location is shown to be L_{90} = 50dBA and L_{90} = 49dBA for daytime and night time respectively.

In order to show the representative background sound level at the areas close to the nearest NSRs, it is necessary to compare the data from the Short-Term locations ST1 and ST2 with the data at the Long-Term location at the relevant matched times.

The tables below show these comparisons.

Date	Time	Measurement Location	L_{90} Background SPL (dBA)	Difference (dB)
19/01/2022	12:00	Long Term	53	6
19/01/2022	12:00	Short Term 1	47	
21/01/2022	09:30	Long Term	54	5
21/01/2022	09:30	Short Term 1	49	
19/01/2022	13:00	Long Term	52	6
19/01/2022	13:00	Short Term 2	46	
21/01/2022	10:30	Long Term	52	7
21/01/2022	10:30	Short Term 2	45	

Table 2: Long-Term and Short-Term Location Background Sound Level Comparison

Looking at the differences between the short term and long-term background sound levels, for both short term locations, it can be deduced that at the short-term Locations, the Background Sound Level is generally 6dB lower than at the long-term measurement location.

Therefore, this difference will be applied to the representative background sound levels previously determined, resulting in L_{90} = 44dBA and L_{90} = 43dBA for daytime and night time respectively.

4.3 Specific Sound

The proposed plant to be installed on site is as follows:

4.3.1 To be installed by units 57 and 60 Dolphin Road

Unit	Model	LWA (dB)	Location
HT CU7	RCS HTB-380-4S-AC20-4R-EC-20L SP OS	75	South of Building on flat roof
HT CU8	RCS HTB-380-4S-AC20-4R-EC-20L SP OS	75	South of Building on flat roof
HT CU9	RCS HTB-380-4S-AC20-4R-EC-20L SP OS	75	North East Corner at ground floor level
HT CU5	RCS HTB-255-4S-AC19-4R-EC-12L SP OS	71	East of Building on flat roof
HT CU6	RCS HTB-190-4S-AC19-4R-EC-12L SP OS	63	South East Corner on flat roof
HT CU4	RCS HTB-125-4S-AC08-4R-EC-7L SP OS	63	East of Building on flat roof
HT CU3	RCS HTB-315-4S-AC19-4R-EC-12L SP OS	71	East of Building on flat roof
LT CU2	RCS HTB-475-4S-AC20-6R-EC-EFC SP OMS	76	East of Building on flat roof
LT CU1	RCS HTB-475-4S-AC20-6R-EC-EFC SP OMS	76	East of Building on flat roof

Table 3: Specific Sound Sources for Units 57 and 60 (Design Condition)

N.B. For the plant in Table 2, above, the A-weighted broadband sound power level data is shown only. 1/1 Octave Band data is available in the appendices of this report.

4.3.2 To be installed by Unit 52 Dolphin Road

All units listed below are to be installed south of Unit 52 Dolphin Road. No frequency data is available for these units with the exception of the Barkell AHU.

- Space CO2 Pack – SPL at 10m = 50dBA (converted to be LWA = 81dBA)
- Gas Cooler which sits on top of Space CO2 Pack – LWA = 87.3 dBA
- Vapour Reduction Chiller – LWA = 90dBA
- Glycol Chiller – LWA = 92dBA

Barkell AHU:

1/1 Octave Band Frequency (Hz)	63	125	250	500	1K	2K	4K	8K
Fan inlet sound power level (dB)	82	87	82	79	77	75	73	70
Fan outlet sound power level (dB)	82	87	83	83	83	80	78	75
For installation in an AHU add +6dB to the values at each frequency								
Fan inlet sound power level (dB) in AHU housing	88	93	88	85	83	81	79	76
Fan outlet sound power level (dB) in AHU housing	88	93	89	89	89	86	84	81

Table 4: Barkell AHU Sound Power Levels

5 Computer Noise Model

5.1 General

It is possible to create a computer noise contour model of how sound pressure levels will propagate across the site and toward nearby NSRs using the computer software “Immi” (Wolfel).

In order to do this, a scaled OS map of the area has been imported to the software and this scale has been defined. The existing commercial buildings and residential buildings have been input along with their heights.

The sound (power or pressure) level data has been entered into the software with each unit separately positioned in line with the proposed plans, provided by the client.

Reception Points have then been created at the nearest NSRs located at Kingsland Close and Church Green to allow calculations to show the sound pressure levels reaching them due to the new proposed plant.

These sound pressure levels can then be rated further, if required, in line with BS4142 and then compared with the existing L_{90} Background Sound Level.

The figure below shows the computer model as described above.

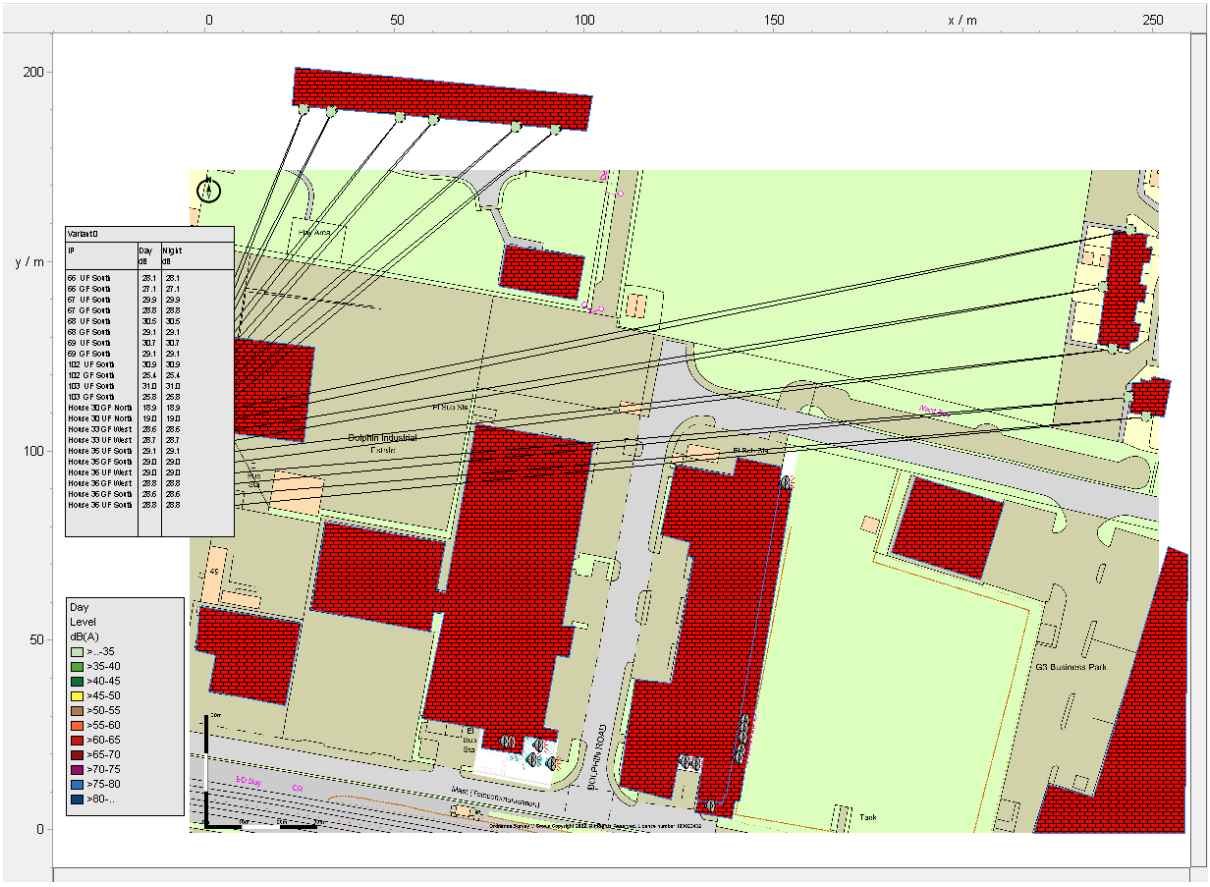


Figure 4: Immi Computer Noise Model

5.2 Immi Output

The tabulated output of the computer noise model's calculations due to the plant all running simultaneously (worst-case) is as follows:

Reception Point	Leq,T (dBA)	Leq,T (dBA) Rounded
House 33 GF West	28.605	29
House 33 UF West	28.703	29
House 35 GF South	28.974	29
House 35 UF South	29.147	29
House 30 GF North	18.853	19
House 30 UF North	19.03	19
House 36 GF South	28.563	29
House 36 UF South	28.775	29
House 36 GF West	28.838	29
House 36 UF West	29.045	29
103 GF South	25.801	26
103 UF South	31.003	31
102 GF South	25.376	25
102 UF South	30.88	31
69 GF South	29.051	29
69 UF South	30.732	31
68 GF South	29.086	29
68 UF South	30.531	31
67 GF South	28.764	29
67 UF South	29.895	30
66 GF South	27.053	27
66 UF South	28.098	28

Table 5: Immi - Tabulated Output

For graphical noise contour maps, please see the appendices of this report.

6 BS4142 Assessment

BS4142 requires that commercial sound sources be “rated” as part of the assessment.

This takes into consideration any penalties for character (tonality, intermittency, impulsivity etc) at the point where the sound from the plant reaches the nearest NSR.

It also takes in to consideration any “on-time” correction to apply if the plant runs for only a short amount of time during the rating period (1-hour for the daytime period or 15-minutes for the night time period) and any distance attenuation or barrier attenuation to be applied.

The distance attenuation is already handled by the computer noise model and shows that the sound pressure levels at all NSRs due to all plant running simultaneously is already, at worst, 12-13dB below the existing L_{90} Background Sound Level for night time and daytime respectively.

6.1 Tonality

None of the 1/1 octave band data suggests that there will be any tonality to apply a penalty against and indeed even if tonal at the source, over the distance it is unlikely that any tonality will be noticed. Thus, no penalty will be applied here.

6.2 Intermittency

Discussion with the client has outlined that the plant will run on demand, thus switching on and off as required to keep the chillers at their optimum temperature. Whilst this will not be immediately switching on and off, but rather on for a while and then off for a while until next needed, it prudent to apply an intermittency penalty of 3dB. It is arguable that at the distances the NSRs are from the plant along with the already low L_{eq} sound pressure levels, intermittency will not be detected, however for a conservative assessment, this penalty will remain.

6.3 Impulsivity

None of this plant is impulsive, thus no penalty will apply here.

6.4 On-Time Correction

It is not possible to deduce how long in any time period an item of plant will be on or off for, and as such this is an area of uncertainty. However, it is possible that the plant may operate for a whole 1-hour daytime rating period or 15-minute night time rating period, especially during the warmer times of the year. For this reason, no on-time correction will be applied, again for a conservative assessment.

6.5 Rating Levels

Table 5 from Section 5.2 of this report has been repeated below as Table 6 with the penalties / corrections applied to show the Rating Level(s).

These Rating Levels will be compared with the representative Background Sound Level and assessed.

Reception Point	Leq,T (dBA)	Leq,T (dBA) Rounded	Intermittency Pentalty (dB)	Rating Level (dBA)	Background		Rating Level minus Background (dB)	
					Day	Night	Day	Night
House 33 GF West	28.605	29	3	32	44	43	**-12**	**-11**
House 33 UF West	28.703	29	3	32	44	43	**-12**	**-11**
House 35 GF South	28.974	29	3	32	44	43	**-12**	**-11**
House 35 UF South	29.147	29	3	32	44	43	**-12**	**-11**
House 30 GF North	18.853	19	3	22	44	43	**-22**	**-21**
House 30 UF North	19.03	19	3	22	44	43	**-22**	**-21**
House 36 GF South	28.563	29	3	32	44	43	**-12**	**-11**
House 36 UF South	28.775	29	3	32	44	43	**-12**	**-11**
House 36 GF West	28.838	29	3	32	44	43	**-12**	**-11**
House 36 UF West	29.045	29	3	32	44	43	**-12**	**-11**
103 GF South	25.801	26	3	29	44	43	**-15**	**-14**
103 UF South	31.003	31	3	34	44	43	**-10**	**-9**
102 GF South	25.376	25	3	28	44	43	**-16**	**-15**
102 UF South	30.88	31	3	34	44	43	**-10**	**-9**
69 GF South	29.051	29	3	32	44	43	**-12**	**-11**
69 UF South	30.732	31	3	34	44	43	**-10**	**-9**
68 GF South	29.086	29	3	32	44	43	**-12**	**-11**
68 UF South	30.531	31	3	34	44	43	**-10**	**-9**
67 GF South	28.764	29	3	32	44	43	**-12**	**-11**
67 UF South	29.895	30	3	33	44	43	**-11**	**-10**
66 GF South	27.053	27	3	30	44	43	**-14**	**-13**
66 UF South	28.098	28	3	31	44	43	**-13**	**-12**

Table 6: Rating Level minus Background

As can be seen in the final two columns of Table 6, above, the $L_{Ar,Tr}$ Rating Level is significantly below the existing L_{90} Background Sound Level with the worst-case situation being 9dB below. Based on this outcome, it is considered that adverse impact will be unlikely, mitigation measures will not be required and that planning should not be withheld on noise grounds.

6.6 Uncertainty

The sound level meters used in the site survey work were calibrated before and after the survey in situ, without any significant drift having occurred, to ensure that the information and data being obtained was representative and that the sound level meter was operating correctly.

Data has also been measured over a number of complete days including a weekend to obtain a useful Background Sound Level dataset for analysis and more than one set of satellite measurements have occurred close to the NSRs to more accurately represent the difference in sound level between the long-term measurement location and the NSRs.

With any calculations made, there has not been any additional rounding of numbers to prevent double handling: Rounding has only occurred once at the final part of the sum and is presented to the reader with an easy-to-understand reference level or single figure.

In terms of plant data, there is broadband and 1/1 octave band data available for the units being measured within this report, though for some, only broadband data was available. Based upon the values of the 1/1 octave data there is nothing to suggest tonality exists. However, even if there was significant tonality which was highly perceptible at the NSR, a penalty of 6dB added to each piece of plant would still allow the Rating Levels to be sensibly below the background sound level at their respective nearest NSRs.

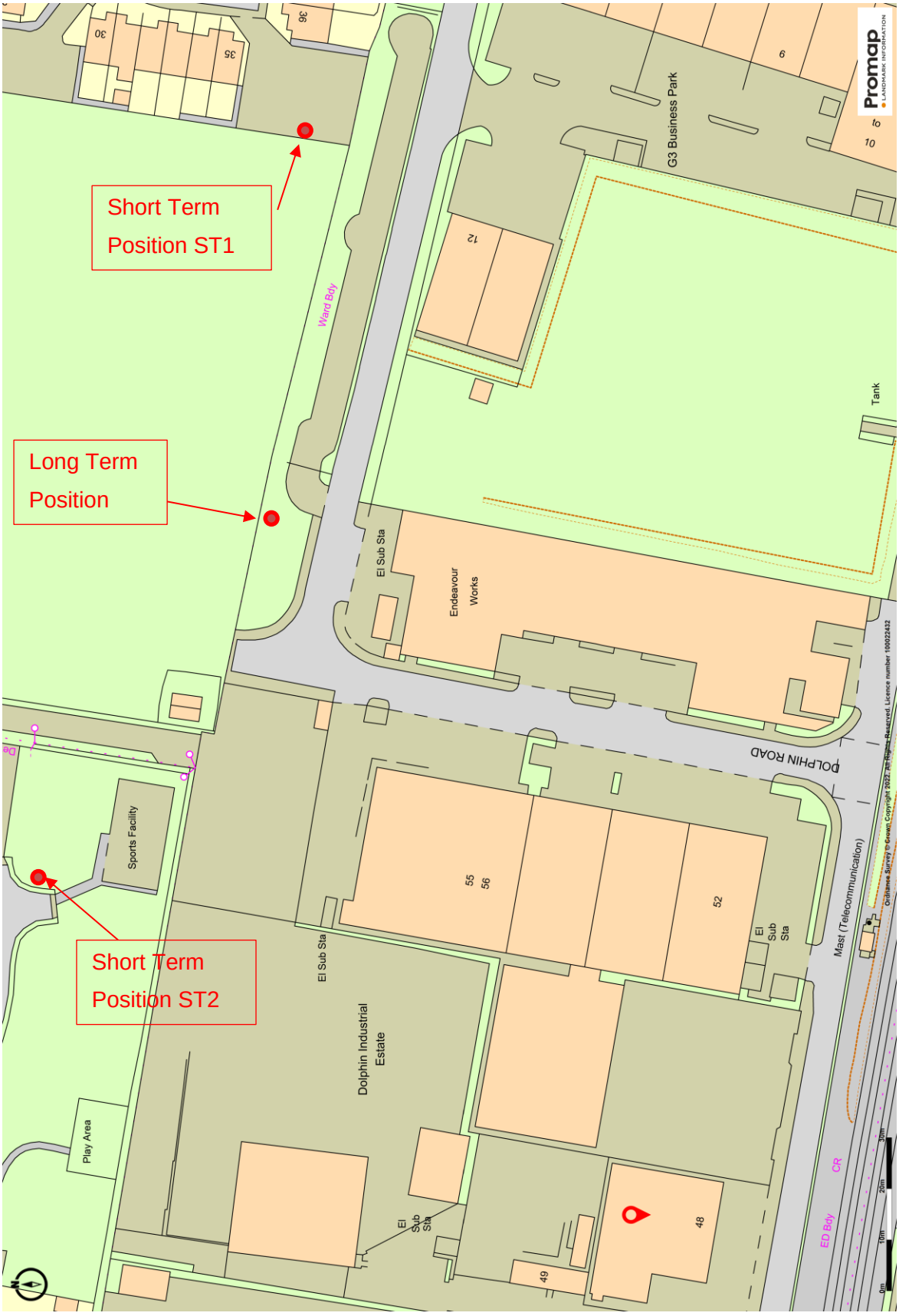
The 3dB penalty for intermittency is not likely to be detected when the Rating Level is as low below BG as has been calculated and therefore it is merely an academic penalty.

It is arguable that with chiller plant which is able to run 24/7 but only running on demand by the nature of thermally-controlled units, an on-time correction could be applied. However, as there is currently no way to measure this and with the possibility that during the hotter months the plant could run for a whole assessment period (1-hour during daytime hours or 15-minutes during night time hours), it was decided to err on the side of caution and not apply any beneficial correction here, thus providing a conservative assessment.

7 Conclusion

The results shown from the computer model in Section 5 of this report and the subsequent rating process in Section 6 in have shown that the sound pressure levels from the proposed new plant operating at Higgidy Kitchen are unlikely to cause adverse impact at the nearest NSRs as they are significantly below the existing L_{90} Background Sound Level.

Appendix A – Background Sound Measurement Locations



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Appendix B – Proposed Plant Locations



Figure 5: Plant to be installed at Unit 52 - in context



Figure 6: Plant to be installed at Unit 52 - more detailed

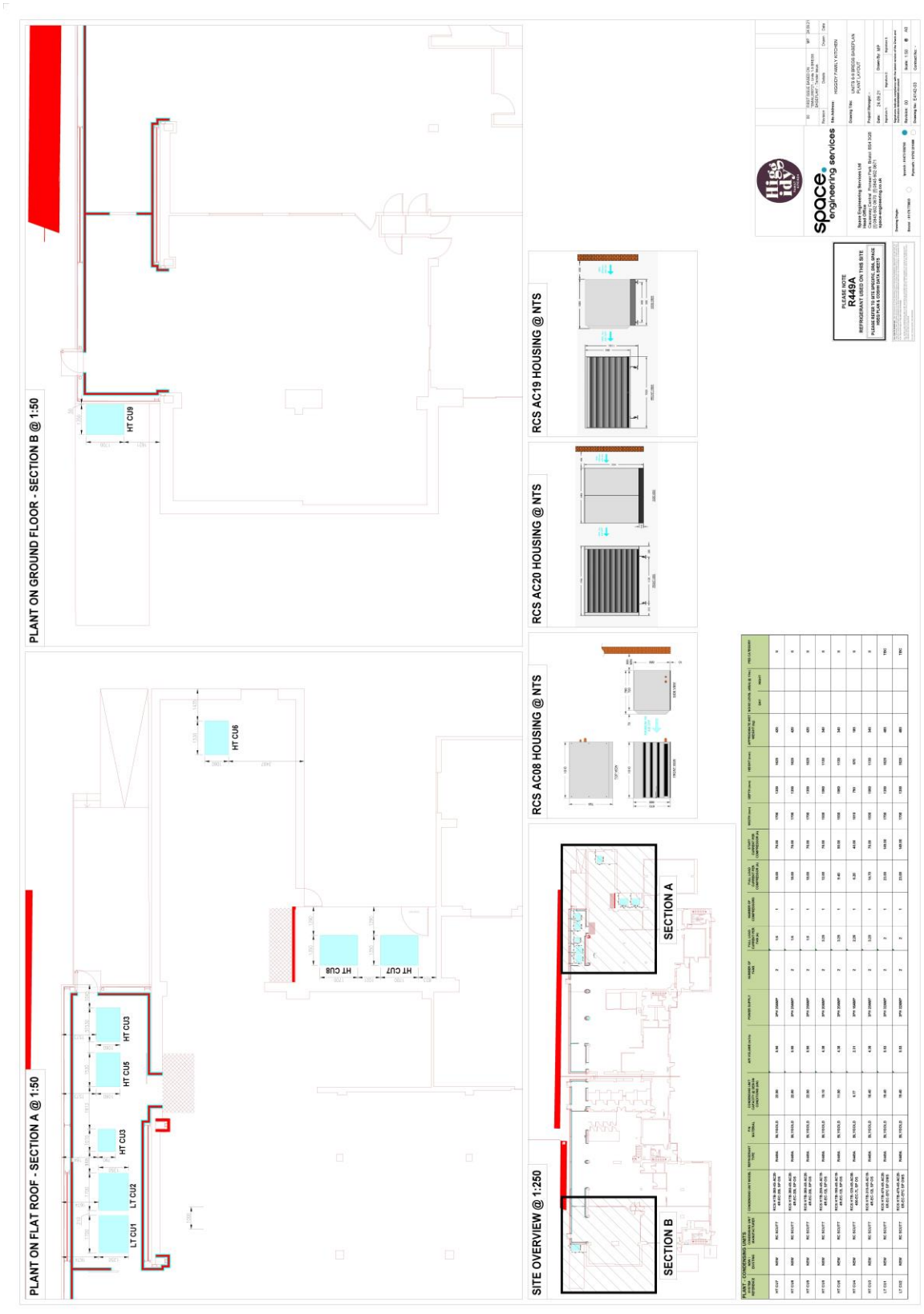
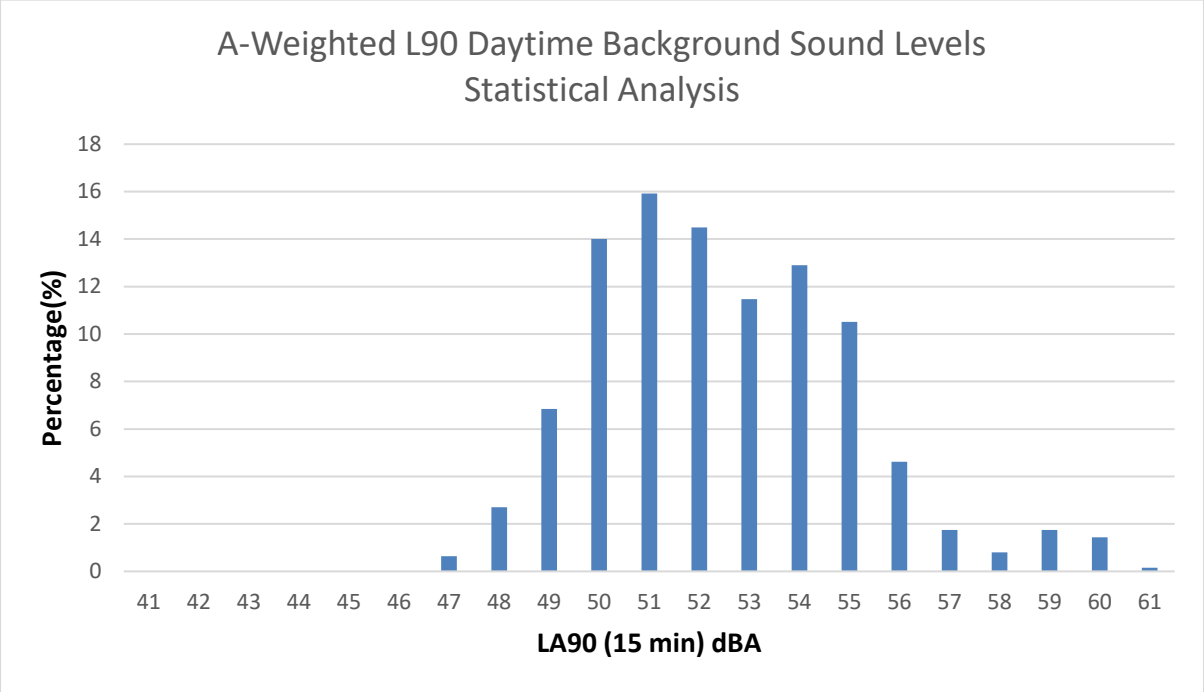
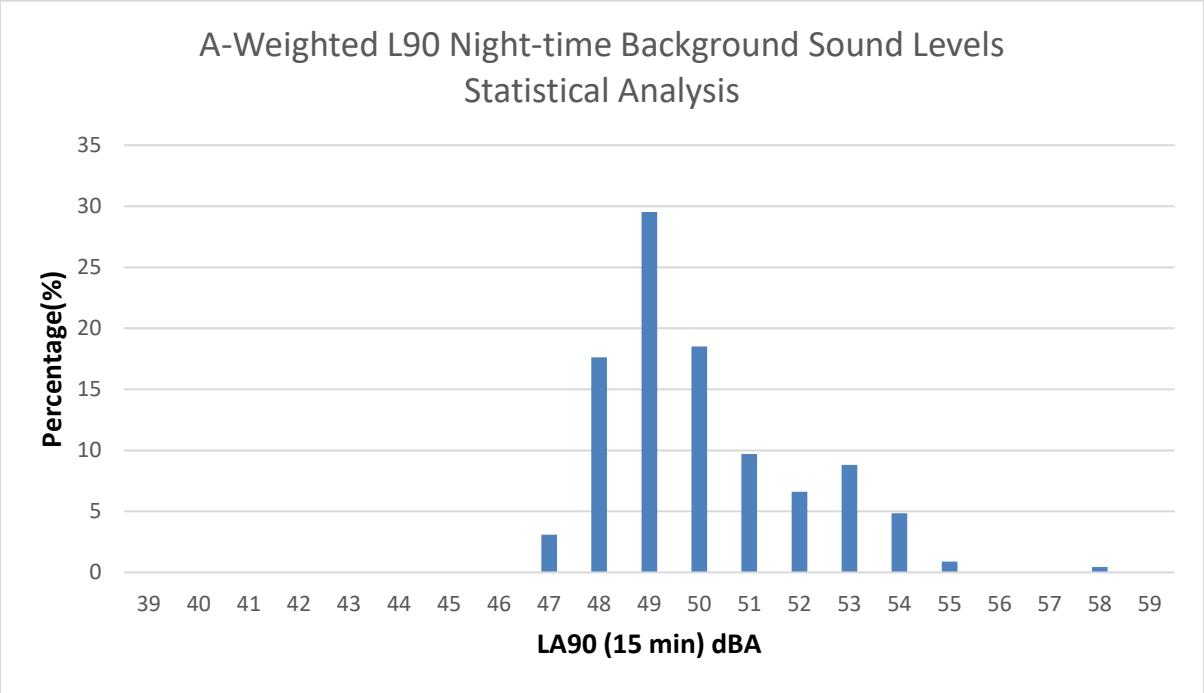


Figure 7: Plant to be installed at Units 57 and 60

Appendix B – Statistical Analysis of Background Sound





Appendix C – 1/1 Octave Band Data of Meadow Plant

	DESIGN CONDITION									
Unit	Model	63	125	250	500	1000	2000	4000	8000	LWA
HT CU7	RCS HTB-380-4S-AC20-4R-EC-20L SP OS	53	62	67	70	73	69	63	56	75
HT CU8	RCS HTB-380-4S-AC20-4R-EC-20L SP OS	53	62	67	70	73	69	63	56	75
HT CU9	RCS HTB-380-4S-AC20-4R-EC-20L SP OS	53	62	67	70	73	69	63	56	75
HT CU5	RCS HTB-255-4S-AC19-4R-EC-12L SP OS	53	60	65	66	63	60	58	54	71
HT CU6	RCS HTB-190-4S-AC19-4R-EC-12L SP OS	57	53	56	61	53	54	55	52	63
HT CU4	RCS HTB-125-4S-AC08-4R-EC-7L SP OS	57	54	55	60	55	54	55	52	63
HT CU3	RCS HTB-315-4S-AC19-4R-EC-12L SP OS	53	60	65	66	63	60	58	54	71
LT CU2	RCS HTB-475-4S-AC20-6R-EC-EFC SP OMS	59	62	66	68	73	69	64	58	76
LT CU1	RCS HTB-475-4S-AC20-6R-EC-EFC SP OMS	59	62	66	68	73	69	64	58	76