Acoustic Associates Sussex Ltd

Noise Impact Assessment Planning Application

Site: **Community Diagnosis Centre, Southlands Hospital**
Client: **Morgan Sindall**

Report by: Simon Barrett BSc(Hons) MSc MIOA

Date: 12/10/2022
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Issue 5

Acoustic Associates Sussex Ltd.

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Issue 1	11/05/2022	Initial Issue
Issue 2	09/06/2022	Revised Section 4.1
Issue 3	27/06/2022	Amended plant, re-modelled acoustically and revised the outcome
Issue 4	26/09/2022	Scheme re-design required a re-model and revisions to the assessment as a whole
Issue 5	12/10/2022	Revision to Issue 4 based on different AHU being used. Thus re-modelled and re-assessed, with a 1dB better outcome.

1 Introduction

Acoustic Associates have been appointed to undertake an acoustic assessment of the proposed refurbishment at Southlands Hospital, Shoreham, to convert an existing block into a new “Community Diagnosis Centre” (CDC). The assessment will be submitted as part of a planning application.

The existing building will be stripped back to shell and core on the ground floor, with a brand-new fit-out occurring internally.

New air-handling plant will be installed within the courtyard space and be situated at ground floor level and external to the building.

The purpose of this assessment is to assess noise levels affecting nearby dwellings as well as noise levels affecting the proposed CDC.

The noise levels for the day and the night time period have been assessed in terms of and following the guidelines of the documents listed below:

- BS8233: Sound insulation and noise reduction for buildings (2014)
- BS4142 (2014+A1-2019) Method for rating industrial noise affecting mixed residential and industrial areas
- Health Technical Memorandum 08-01: Acoustics (HTM) 2013

Area Background Sound Pressure levels have been measured in the courtyard area, which will be the location of the new plant and representative to the CDC as it is the adjacent area. It is also considered to be representative of the nearest residential noise sensitive receptors (NSRs) closeby.

For the nearby dwellings, the predicted levels in terms of BS4142 plant noise rating levels will be significantly lower than background sound levels irrespective of the time period. This would usually be sufficient to satisfy common planning condition criteria delated by Local Authorities.

In terms of environmental noise affecting the refurbished hospital areas, the surveyed noise levels demonstrate that for noisy parts of the day windows would have to be closed to achieve the guidance values within the HTM document. This should be acceptable as the most affected rooms will be fully mechanically ventilated via the new air handling unit.

Achieving these criteria will result in a good acoustic environment inside/outside the existing dwellings and refurbished hospital rooms.

For the reasons above it is considered that planning permission would not be refused on noise grounds albeit with possible planning conditions relating to noise.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Site Description

The project will refurbish the ground floor of an existing hospital block at Southlands Hospital, Shoreham-by-Sea. The refurbishment will strip the block back to shell and create a brand-new space. The first floor will remain un-altered.

Included within the works will be the addition of new heating, cooling and air handling mechanical plant. The plant is to be installed in the court-yard area at ground floor level.

2.2 National Planning Policy Framework (NPPF) July 2021

The National Planning Policy Framework (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 document recommends: *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.*

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:

- *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 the quality of life;*
- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;*

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.

The Framework states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution. It does not, however, provide any specific formal guidelines.

2.3 Assessment Methodology

The noise impact assessment will investigate the potential for the proposed development to give rise to impacts (due to sound levels) on the amenity of nearby existing dwellings close to the development. The impact of environmental noise sources, affecting the refurbished hospital areas, has also been assessed.

2.3.1 Likely Significant Effects

In terms of noise significant effects may have adverse effects on health and quality of life of people living in the proposed development.

Noise Policy Statement for England (NPSE) introduces the term SOAEL (Significant Observed Adverse Effect Level). This is the level above which significant adverse effects on health and quality of life occur.

Significant effects of noise may cause changes in behaviour and/or attitude, e.g. having to keep windows closed and may have the potential to disturb sleep.

2.3.2 Methodology

The noise impact assessment methodology has been summarised below:

- Survey
    - Measure baseline noise levels in an area representative to both the nearest NSRs as well as the proposed CDC.
- Predict
    - Use noise propagation calculations to predict plant noise levels at the nearest NSR location
    - Use noise propagation calculations to predict the plant noise levels incident upon the CDC and other hospital departments.
- Assessments
    - Complete assessments using standard documents to identify where significant effects may occur. Guidance documents will include
        - BS4142:2014+A1:2019
        - HTM 08-01

2.4 Noise Criteria

It is recommended in this case that appropriate criteria are provided by:

- World Health Organisation (WHO) - Guidelines for Community Noise 1999
- BS4142 (2014+A1-2019) Method for rating industrial noise affecting mixed residential and industrial areas

2.4.1 BS4142: 2014: Method 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.

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 noise level, this is an indication of the specific sound source having a low impact, depending on the context.

2.5 HTM Requirements Internal Ambient Noise Level (IANL)

Room type	Example	Criteria for noise intrusion to be met inside the spaces from external sources (dB)
Ward – single person	Single-bed ward, single-bed recovery areas and on-call room, relatives' overnight stay	40 $L_{Aeq,\ 1hr}$ daytime 35 $L_{Aeq,\ 1hr}$ night 45 $L_{Amax,\ f}$ night
Ward – multi-bed	Multi-bed wards, recovery areas	45 $L_{Aeq,\ 1hr}$ daytime 35 $L_{Aeq,\ 1hr}$ night 45 $L_{Amax,\ f}$ night
Small office-type spaces	Private offices, small treatment rooms, interview rooms, consulting rooms	40 $L_{Aeq,\ 1hr}$
Open clinical areas	A&E	45 $L_{Aeq,\ 1hr}$
Circulation spaces	Corridors, hospital street, atria	55 $L_{Aeq,\ 1hr}$
Public areas	Dining areas, waiting areas, playrooms	50 $L_{Aeq,\ 1hr}$
Personal hygiene (en-suite)	Toilets, showers	45 $L_{Aeq,\ 1hr}$
Personal hygiene (public and staff)	Toilets, showers	55 $L_{Aeq,\ 1hr}$
Small food-preparation areas	Ward kitchens	50 $L_{Aeq,\ 1hr}$
Large food-preparation areas	Main kitchens	55 $L_{Aeq,\ 1hr}$
Large meeting rooms (>35 m^2 floor area)	Lecture theatres, meeting rooms, board rooms, seminar rooms, classrooms	35 $L_{Aeq,\ 1hr}$
Small meeting rooms (≤35 m^2 floor area)	Meeting rooms, seminar rooms, classrooms, board rooms	40 $L_{Aeq,\ 1hr}$
Operating theatres	Operating theatres	40 $L_{Aeq,\ 1hr}$ 50 $L_{Amax,\ f}$
Laboratories	Laboratories	45 $L_{Aeq,\ 1hr}$

Figure 1: Table 1 from HTM - IANL Criteria

3 Noise Survey Baseline Conditions & Results

A noise survey was carried out between the 21st to the 27th April 2022 to assess the existing Leq, L90 and Lmax sound levels representative to the proposed CDC location and the existing NSRs nearby. The measurements during daytime periods on the 21st and 22nd will be removed due to drilling occurring on site.

3.1 Noise Survey Details

Survey carried out by:	David Kendal BA(Hons) TechIOA
	Simon Barrett BSc(Hons) MSc MIOA
Equipment used:	Svantek 971 “Moles” Type 1 Sound Level Meter
Weather conditions:	Dry, Wind Speed <5m/s

The meters were calibrated before commencing the noise measurements (@94dB). The calibration was re-checked at the end of the measurements to ensure that no calibration drift had occurred. After survey the calibration showed no significant drift (94dB).

3.2 Noise Survey Location

3.2.1 Unattended Sound Survey

The noise survey location within the courtyard by the proposed CDC building can be seen on the marked-up plan within the appendix.

The survey microphone was around greater than 3.5m from building façades and as such the results are classed as free-field levels.

All noise levels in this report will be free-field noise levels unless stated otherwise (including noise model predictions).

3.3 Noise Survey Results

The Leq Ambient noise level survey results summary can be found in the table below – this is relevant to the sound levels incident upon the proposed CDC.

Please note that whilst the night-time LAeq,8hr values are shown, they will not be utilised as the CDC will not operate during the night time hours:

Date	Free-field Level - dBA		
	Day 07:00-23:00		Night 23:00-07:00
	$L_{Aeq,16hr}$	Highest $L_{Aeq,1hr}$	$L_{Aeq,8hr}$
22-Apr	-	-	48.8
23-Apr	55.7	57.2	49.4
24-Apr	54.8	56.4	50.9
25-Apr	54.8	58.2	51.4
26-Apr	52.3	55.6	51.1
Average	**54.4**	**56.9**	**50.3**

Table 1: LT1 Survey Results – LAeq,T

The Background sound level ($L_{A90,15min}$) graphical data can be seen below for Daytime and for Night time periods (whilst the CDC is outpatient only with no overnight patient stays, the plant may still operate for the sake of the correction function of the hospital equipment):

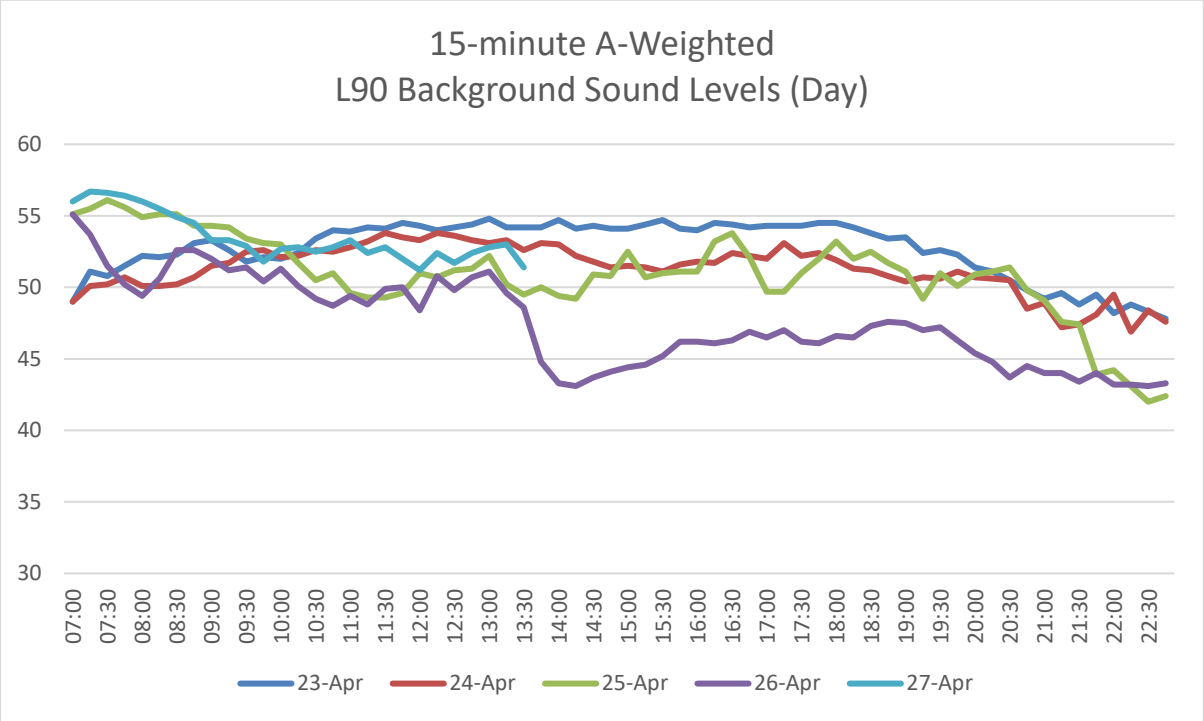

Figure 2: Daytime Background Sound Graph

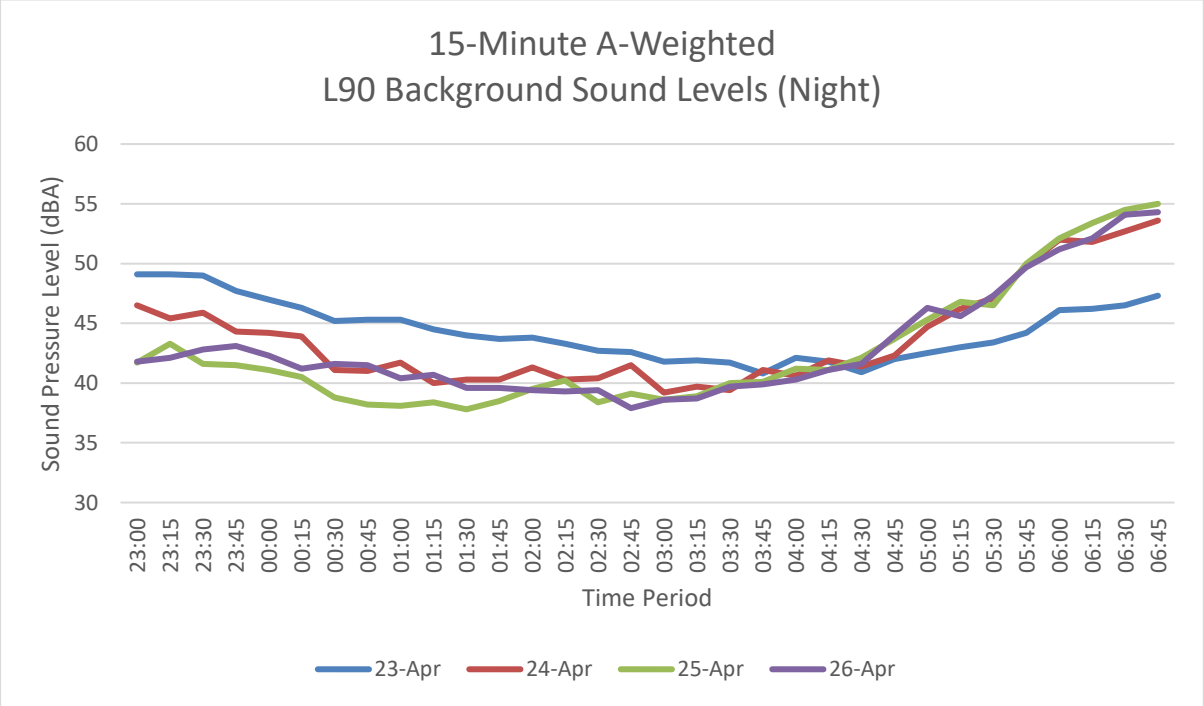

Figure 3: Night time Background Sound Graph

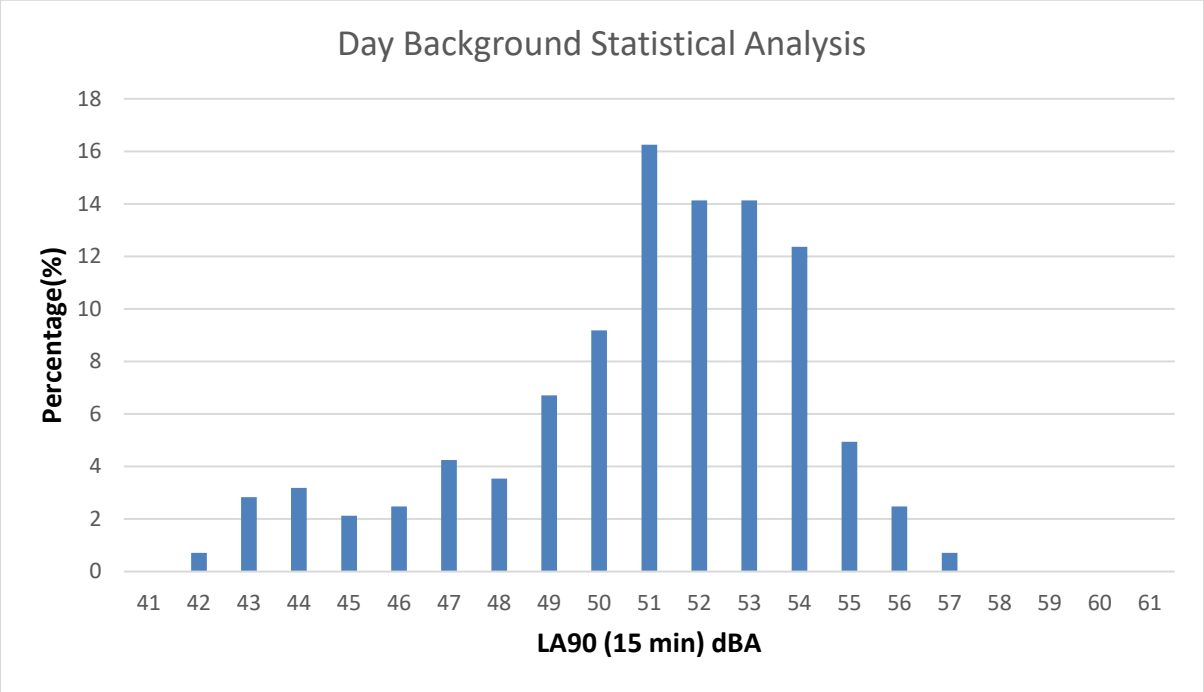

Figure 4: Daytime Background Sound Modal Graph

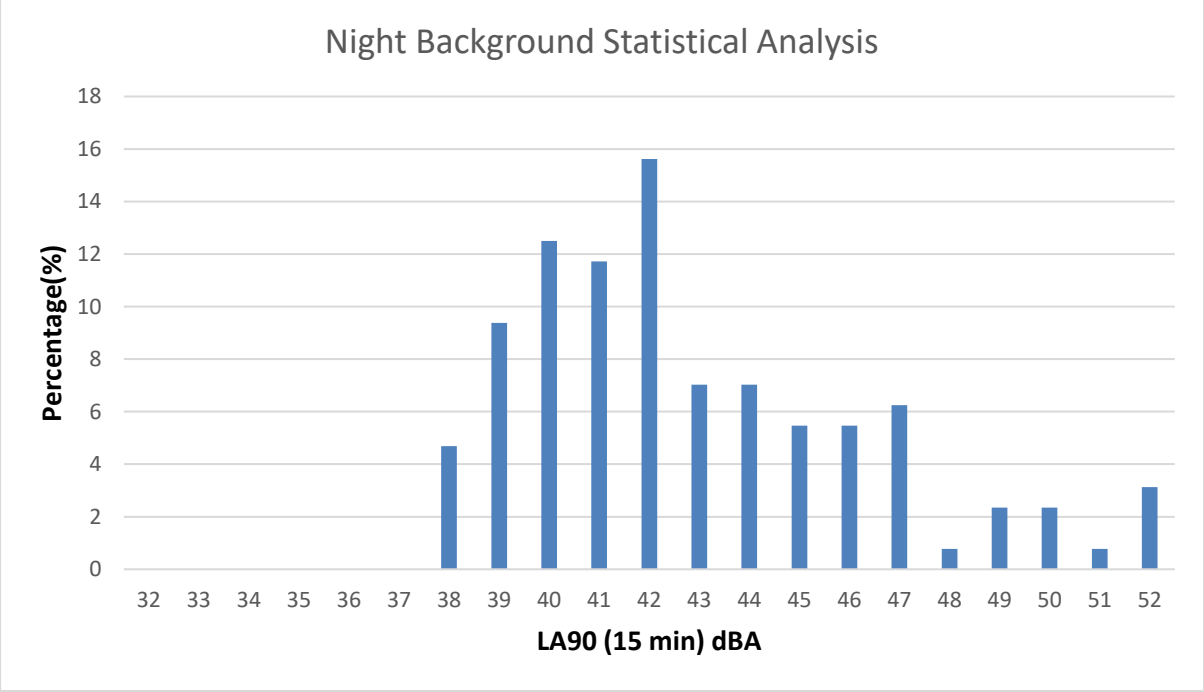

Figure 5: Night time Background Sound Modal Graph

From the above figures the representative background sound level has been determined as:

- Representative Daytime Background sound level = 51dBA (modal value)
- Representative Night time Background sound level = 40dBA (lower than modal value)

4 Noise Model

In order to see how noise varies at different positions around the proposed development it is possible to produce a noise contour map.

A computer noise model has been completed using the computer package IMMI. IMMI faithfully implements the propagation method of ISO-9613:1996; Acoustics – Attenuation of sound during propagation outdoors.

The development and surrounding buildings were added to the model along with various reception points (RPs). The RPs predict the noise level (incident noise level) at a discrete position within the noise model

4.1 Plant Details

The (double stacked) AHU is installed at ground floor level in the existing courtyard area, external to any building.

The Chillers are to be located at ground floor level on concrete plinths within the courtyard area.

The Air Source Heat Pumps will be located to the south of the building.

It is understood that plant may operate during the day and night. It is understood that the CDC will be served by the following plant:

- Air Handling Unit (AHU) - 1No. ECE TS40511 50cc - 12
- Chiller Units – 2No. Parker Hyperchill ICE090
- Air Source Heat Pumps – 2No. RHOSS WinPack TXAEQU 4190 DP2

1/1 Octave band Sound Power data is available for the AHU and for the Air Source Heat Pumps, but only broadband data is available for the chiller units. All this data will be used for the assessment (see appendix for details).

It is assumed that any louvres from the plant room - where the AHU is installed - are non-acoustic.

4.2 New Plant Noise Model Methodology

A single point source has been added to the noise model for each of the items detailed above. Point source sound power levels are as detailed in the Manufacturers datasheets (see appendix for further details). 1/1 Octave Band data has been provided where possible.

No “on-time” corrections were detailed within the model which results in the predictions calculated in the noise level with all machines running for the hour-long reference time period.

Reception Points (RPs) were added to the computer noise model for each of the representative noise sensitive receptor housing blocks nearby.

The tabulated output data can be seen in Table 2, overleaf, along with a graphical output showing the layout with noise level annotations.

For a noise contour model, this can be seen in the appendix of the report.

4.3 Noise Model Output

The output from the Immi computer noise model shows the following results:

Reception Point	Sound Pressure Level (dBA)	Representative NSRs
RP1	28.6	29 - 33 Longshore Drive
RP1-1st	34.6	29 - 33 Longshore Drive
RP2	20.9	21 - 27 Longshore Drive
RP2-1st	21.3	21 - 27 Longshore Drive
RP3	16.6	11 - 19 Longshore Drive
RP4	14.5	1 - 9 Longshore Drive
RP5	18.9	35 Longshore Drive
RP6	17.2	24 - 28 Longshore Drive
RP7	15.8	14 - 24 Longshore Drive
RP8	13.1	6 - 12 Longshore Drive

Table 2: Computer Noise Model Output

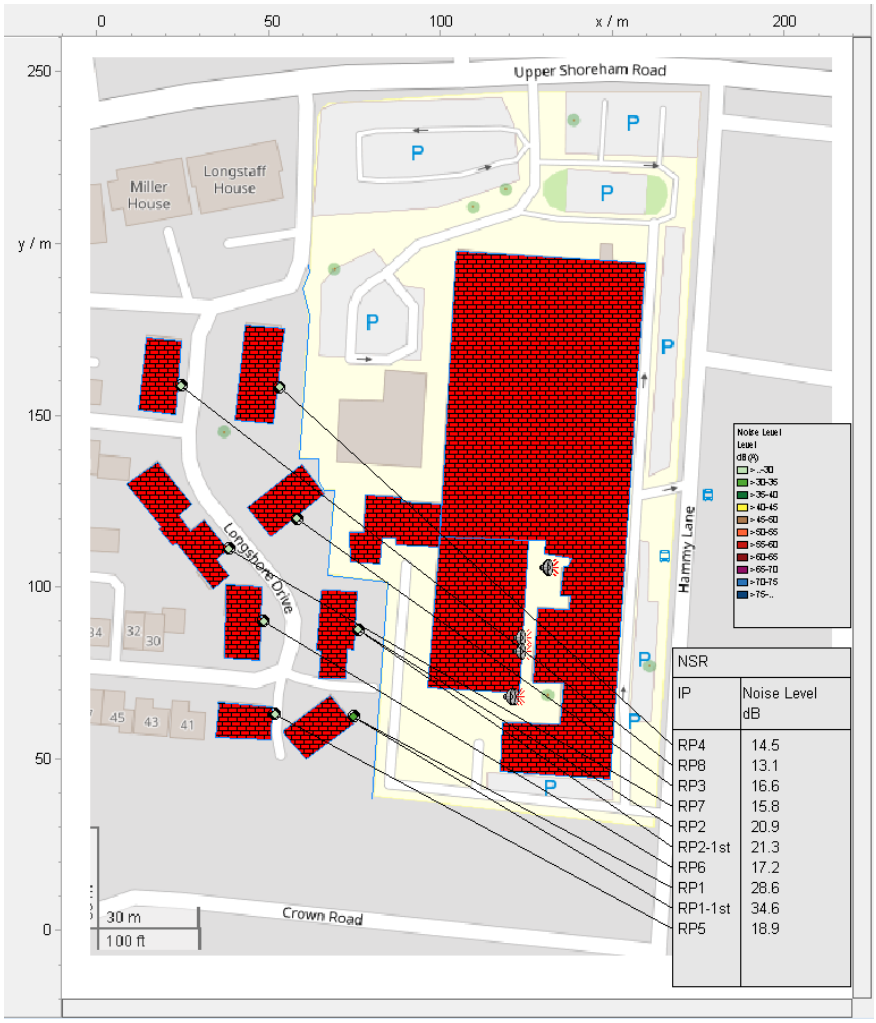

Figure 6: Basic Computer Noise Model

5 BS4142 Assessment

5.1 Representative Background Noise level

As determined and shown in Section 3.3 the following daytime and night time representative background sound levels are:

- Representative Daytime Background sound level = 51dBA (modal value)
- Representative Night time Background sound level = 40dBA (lower than modal value)

5.2 Rating Level – Tonality/Intermittency

BS4142 states the following: *"Identify tones using the method given in Annex C, then add a correction of 6 dB if a tone is present."* Based on the output of the Immi computer noise model predictions and assessing 1/1 Octave Band data, there is no indication of tonality.

It is also unlikely that the intermittency of the chiller units will be "readily distinctive against the residual acoustic environment" as the specific sound level due to the plant is significantly lower than the existing background sound level.

It should also be re-iterated that no on time reductions have been implemented as it is considered that the plant will run constantly.

5.3 Assessment

The noise survey and model demonstrate that with all plant running (100% duty for 100% of the time) the noise rating level is at worst:

- New Plant (35dBA at the nearest NSR) is 16dB below the background sound level during the daytime and 5dB below the background sound level during the night time.

5.4 Discussion and Context

The Standard provides guidance that:

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.

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.

Notwithstanding the fact that the Rating Level of the plant in the worst case, with all plant running at the same time being parity with background sound levels, the following contextual information is considered relevant in completing the noise assessment:

- New Sources of noise are to be installed on a site containing an existing development with existing mechanical plant.
- Majority of plant will also be significantly hidden by being located either in an existing courtyard within the hospital grounds or by being located within an actual plant room.
- Additionally, the plant will be significantly attenuated by these locations with the addition of the building itself.
- The exception to the above is the newly proposed ASHPs being closer to the NSRs on the west of the hospital building, however an existing 5m high brick wall will provide

significant reduction in sound intrusion, plus will block sight-lines from 1st floor windows.

This should significantly reduce the likely hood of complaint.

5.5 Uncertainty

- Noise levels detailed in the report were completed during suitable weather conditions
- Noise model was completed with manufacturer's data which is usually at maximum capacity.
- Completing the survey on the hospital land may have marginally overestimated the background sound level. However, for the night time, to err on side of caution, a lower value than the modal value was used.
- Where assumptions have been made, the worst case has usually been allowed for.

Even taking into account any negative uncertainties, the rating level of the new plant will still be, at worst, parity with the night time background sound level.

6 HTM Noise Assessment

The proposed layout of the refurbished rooms shows various rooms along the southern façade (most affected by environmental noise due to the access road). The survey was completed on this façade to determine the ambient noise level (1hour time period as detailed in HTM) outside the ground floor rooms.

For the 4 days of the survey the highest 1-hour sound level was 58dBA (rounded to the nearest whole number). The average highest level was 57dBA (rounded to the nearest whole number).

For the most sensitive rooms the internal ambient noise level should be no more than 40dBA.

This results in a required sound reduction of no more than 18dB. This sound reduction is likely to be achieved if the existing double-glazed windows are closed.

This should be acceptable as the rooms will be fully mechanically ventilated via the mechanical ventilation system.

7 Summary and Conclusion

Existing noise levels have been measured on site prior to the development being completed.

Noise levels have been predicted using Manufacturer's noise data and the computer program IMMI (Wolfel).

A noise model has been completed to predict noise breakout from the proposed development's plant

Existing and proposed sound levels have been assessed in terms of and following the guidelines of the following documents:

- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- BS4142 (2014) Method for rating industrial noise affecting mixed residential and industrial areas
- Health Technical Memorandum 08-01: Acoustics (HTM) 2013

7.1 Internal/External Noise Criteria – Nearby Dwellings

The model has been used to predict that the noise level *inside* the most affected NSR will be no more than 24dBA (very worst case with all plant running simultaneously at 100% duty) assuming an open window (which provides 12dB attenuation against a free-field sound pressure level). This is 6dB lower than even the night time 8-hour Leq requirement of WHO and BS8233 (30dBA in bedrooms during night time hours).

Noise levels in gardens are well below even the WHO 50dBA lower limit.

7.2 Internal Ambient Noise Level in Refurbished Hospital Spaces

In terms of environmental noise affecting the refurbished hospital areas, the surveyed noise levels demonstrate that for noisy parts of the day windows would have to be closed to achieve the guidance values within the HTM document. This should be acceptable as the most affected rooms will be fully mechanically ventilated via the new air handling unit.

7.3 BS4142 – Nearby Dwellings

The BS4142 assessment predicts relatively low impact from the proposed plant as the noise rating level will be significantly lower than both the daytime and the night time representative background sound levels.

7.4 Conclusion

Achieving these criteria will result in a good acoustic environment inside/outside the existing dwellings close to the development as well as inside the refurbished hospital rooms.

For the reasons above it is considered that planning permission would not be refused on noise grounds albeit with possible planning conditions relating to noise.

8 Appendix

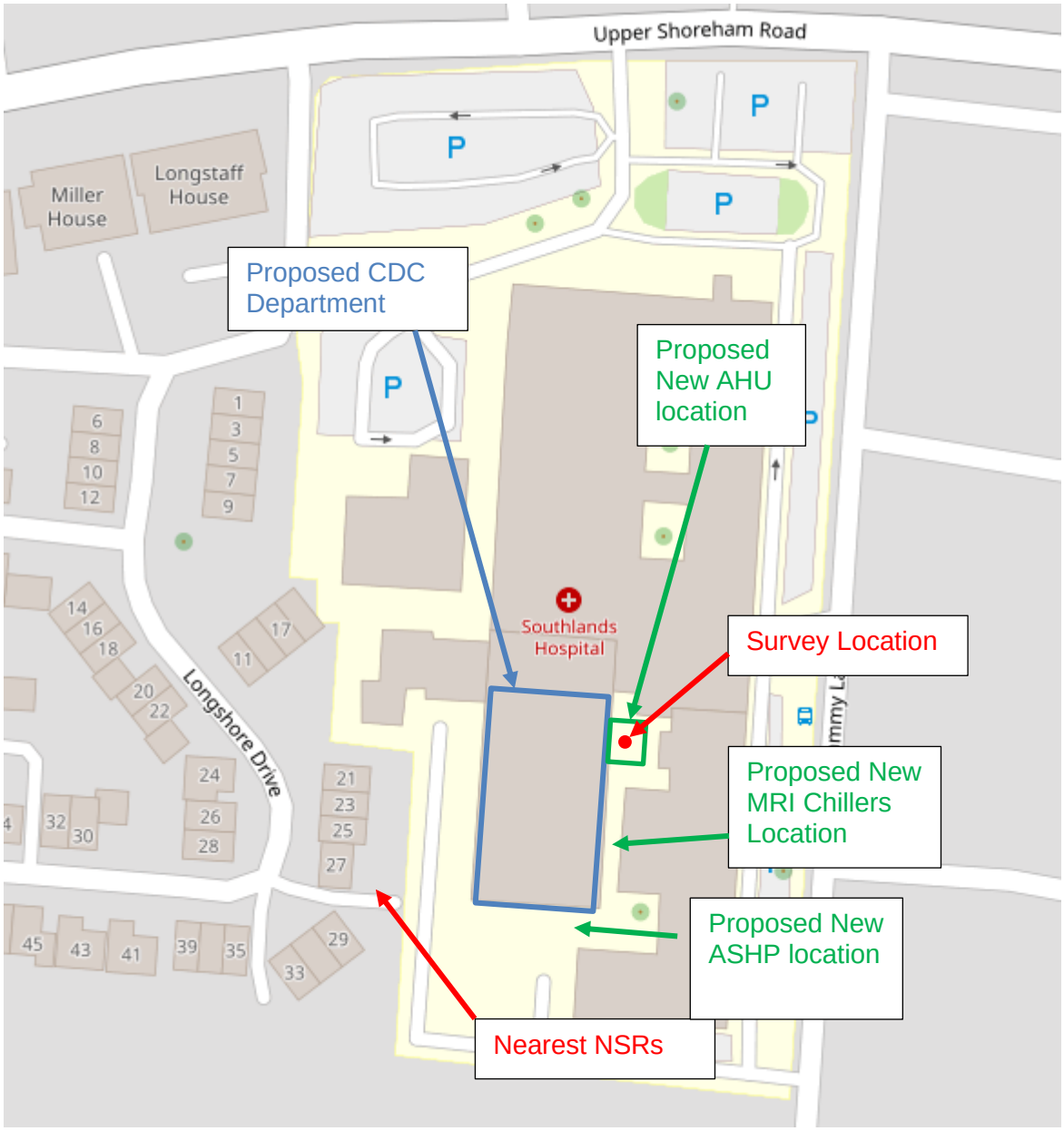

Figure 7: Contextual Site Map showing Survey Location and Proposed Plant Locations



Figure 8: Photo of Survey Location

CDC Southlands

The following is the air handling unit (AHU) Induct Sound Power Levels (SWL)

AHU02 Induct SWL

Octave Band (Hz)		63	125	250	500	1K	2K	4K	8K
Fresh Air Connection	dB	77	73	77	69	63	62	56	57
Supply Connection	dB	75	72	78	75	75	76	67	66
Extract Connection	dB	79	83	74	69	64	66	57	54
Exhaust Connection	dB	79	83	82	81	84	79	73	69

Figure 9: AHU Sound Levels

TXAETU-TXAEQU MODEL		4140	4160	4190	4210	4230	4260	4300	4330
TXAETU sound pressure	dB(A)	54	55	57	57	58	60	61	62
TXAEQU sound pressure	dB(A)	48	49	51	51	52	54	55	56
TXAETU sound power	dB(A)	86	87	89	89	90	92	93	94
TXAEQU sound power	dB(A)	80	81	83	83	84	86	87	88
Scroll/step compressor	n.	4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4
Circuits	n.	2	2	2	2	2	2	2	2
Electrical supply	V-ph-Hz	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50	400-3-50

Figure 10: Chiller Sound Levels

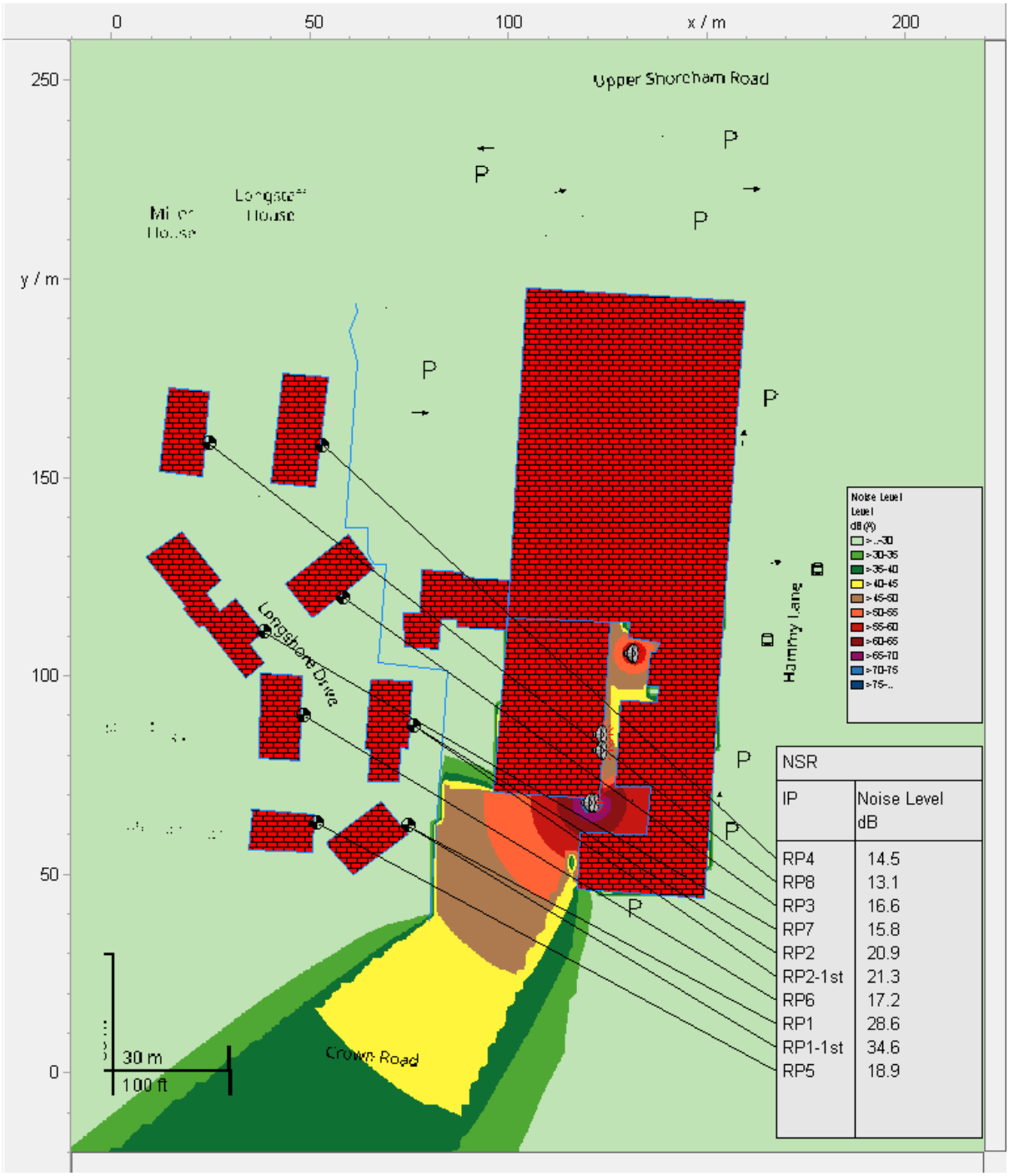

Figure 11: Computer Noise Contour Model (Ground Floor)

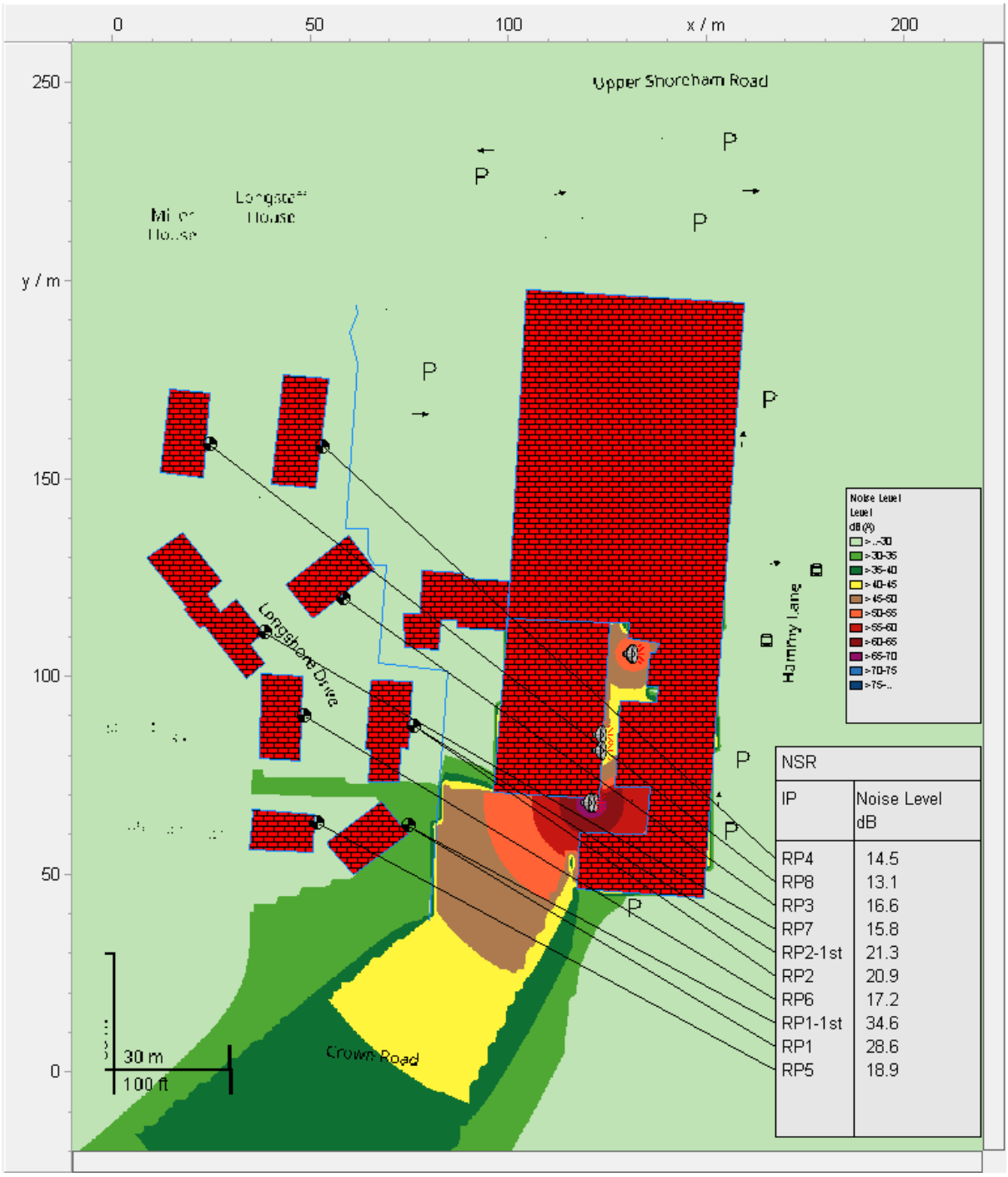

Figure 12: Computer Noise Contour Model (1st Floor)

SVANTEK

ISO9001 certified

FACTORY CALIBRATION DATA OF THE *SVAN 971 No. 96147*

with preamplifier SVANTEK type SV18 No. 101127 and with microphone ACO type 7052E No. 78253

1. CALIBRATION* (acoustical)

LEVEL METER function; Range: Low; Reference frequency: 1000Hz, Sound Pressure Level: 114.02 dB

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	114.02	113.95	-0.07
A	114.02	113.95	-0.07
C	114.02	113.95	-0.07

Calibration measured with the microphone ACO type 7052E No. 78253. Calibration factor: -0.08 dB.

2. LINEARITY TEST* (electrical)

LEVEL METER function; Range: Low; Characteristic: A; f_{ref}= 31.5 Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	83.0
Error [dB]	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

LEVEL METER function; Range: Low; Characteristic: A; f_{ref}= 1000 Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	123.0
Error [dB]	0.1	0.1	0.0	0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0

LEVEL METER function; Range: Low; Characteristic: A; f_{ref}= 8000 Hz

Nominal result LEQ [dB]	24.0	25.0	26.0	28.0	30.0	40.0	60.0	80.0	100.0	122.0
Error [dB]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	0.0	-0.0

LEVEL METER function; Range: High; Characteristic: A; f_{ref}= 31.5 Hz

Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	97.0
Error [dB]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LEVEL METER function; Range: High; Characteristic: A; f_{ref}= 1000 Hz

Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	137.0
Error [dB]	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0

LEVEL METER function; Range: High; Characteristic: A; f_{ref}= 8000 Hz

Nominal result LEQ [dB]	34.0	35.0	36.0	38.0	40.0	60.0	80.0	100.0	120.0	136.0
Error [dB]	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.0	0.0	-0.0	-0.0

1/3 OCTAVE (1kHz); Range: Low; f_{ref}= 1000 Hz

Nominal result [dB]	25.0	30.0	40.0	60.0	80.0	100.0	120.0	123.0
Error [dB]	0.1	0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0

3. TONE BURST RESPONSE*

LEVEL METER function; Characteristic: A; f_{ref}= 4000 Hz; Burst duration: 2s

Range: **Low**; Steady level nominal result = 120dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.35
MAX	Fast	Indication [dB]	120.0	119.9	119.0	117.4	115.2	111.7	108.8	105.9	102.0	98.9	95.9	92.9
		Error [dB]	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	0.0	-0.0	-0.1	-0.1	-0.1
	Slow	Indication [dB]	117.9	115.8	113.5	110.9	107.7	103.7	100.8	96.8	92.9	-	-	-
		Error [dB]	-0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.0	-0.1	-0.1	-	-	-
SEL	-	Indication [dB]	120.0	117.0	113.0	110.0	107.0	103.0	100.0	97.0	93.0	89.9	86.9	83.8
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1

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Range: **Low**; Steady level nominal result = 60dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	Indication [dB]	60.0	59.9	59.0	57.4	55.2	51.7	48.8	45.9	42.0	38.9	35.9
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.1
	Slow	Indication [dB]	57.9	55.9	52.5	49.7	46.8	42.8	39.9	36.9	32.8	-	-
		Error [dB]	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-
SEL	-	Indication [dB]	60.0	57.0	53.0	50.0	47.0	43.0	40.0	37.0	33.0	30.0	27.0
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	-0.0	-0.0

Range: **Low**; Steady level nominal result = 35dB

Result	Detector	Duration [ms]	1000	500	200
MAX	Fast	Indication [dB]	35.0	34.9	34.0
		Error [dB]	0.0	0.0	0.0
	Slow	Indication [dB]	32.9	30.9	27.6
		Error [dB]	-0.0	-0.0	-0.0
SEL	-	Indication [dB]	35.0	32.0	28.0
		Error [dB]	0.0	0.0	0.1

Range: **High**; Steady level nominal result = 134dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.25
MAX	Fast	Indication [dB]	134.0	133.9	133.0	131.4	129.2	125.7	122.8	119.9	116.0	112.9	109.9	106.9
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.1	-0.1	-0.1
	Slow	Indication [dB]	131.9	129.9	126.5	123.7	120.8	116.8	113.9	110.9	106.9	-	-	-
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-	-
SEL	-	Indication [dB]	134.0	131.0	127.0	124.0	121.0	117.0	114.0	111.0	107.0	103.9	100.9	97.9
		Error [dB]	0.0	-0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1	-0.1

Range: **High**; Steady level nominal result = 54dB

Result	Detector	Duration [ms]	1000	500	200	100	50
MAX	Fast	Indication [dB]	54.0	53.9	53.0	51.4	49.1
		Error [dB]	0.0	0.0	0.0	0.0	-0.0
	Slow	Indication [dB]	51.9	49.8	46.5	43.6	40.8
		Error [dB]	-0.0	-0.0	-0.1	-0.1	-0.1
SEL	-	Indication [dB]	54.0	51.0	47.0	44.0	41.0
		Error [dB]	0.0	0.0	0.0	0.0	0.0

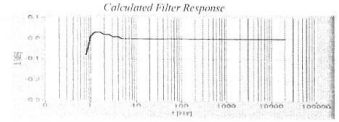
Range: **High**; Steady level nominal result = 45dB

Result	Detector	Duration [ms]	1000	500	200
MAX	Fast	Indication [dB]	45.0	44.9	44.0
		Error [dB]	0.0	0.0	0.0
	Slow	Indication [dB]	43.0	41.0	37.7
		Error [dB]	-0.1	0.0	0.1
SEL	-	Indication [dB]	45.0	42.0	38.1
		Error [dB]	0.0	0.0	0.0

4. FREQUENCY RESPONSE* (electrical)

LEVEL METER function; Characteristic: Z; Range: Low; Input signal =120 dB;

Calculated Filter Response



Measured Filter Response with Preamplifier SV18 (f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	0.0	4000	-0.0
12.5	-0.0	125	0.0	8000	0.0
16	0.0	250	0.0	16000	0.0
20	0.0	500	0.0	20000	0.0
25	0.0	1000	0.0		
31.5	0.0	2000	-0.0		

All frequencies are nominal center values for the 1/3 octave bands

5. INTERNAL NOISE LEVEL* (electrical - compensated)

LEVEL METER function; Range: Low; (Back-light – off) ; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤20	≤12	≤12

* measured with preamplifier SVANTEK type SV18 No. 101127.

6. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A; (Backlight – off)

Range	Low	High
Indication [dB]	≤15	19.6

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
21 °C	35%	1015 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	84	Signal generator
2.	SVANTEK	SVAN 912A	9537	Sound &Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV30A	24563	Acoustic calibrator
5.	SVANTEK	ST02	-	Microphone equivalent electrical impedance (18pF)

CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with th. internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Krzysztof Kubel ..... Test date: 2020-09-18

Figure 13: Calibration Certificate