

Project

West Cumberland Hospital – Phase 2
Plant Noise Assessment

Prepared for

Graham Construction
1st Floor
Unit 4 Digital Park
Pacific Way
Salford Quays
M50 1DR

Published

19 September 2023

Quality Assurance	
Project Title:	West Cumberland Hospital – Phase 2
Report Title:	Plant Noise Assessment
Report Number:	43048-SRL-YA-RP-006-S2-PI
Client:	Graham Construction
Client Address:	1st Floor Unit 4 Digital Park Pacific Way Salford Quays M50 1DR
Author:	Jack Miller BEng (Hons) AMIOA
Additional information:	

Version History

Version	Date	Comments	Approved by
PI	19/09/2023	-	Chris Wright BA(Hons), MIOA

Summary

We have assessed the impact of noise from external plant located on the new two storey extension in West Cumberland Hospital, to satisfy planning condition 10 of the planning approval document.

The results of our assessment indicate that the noise from the proposed plant at the nearest residential buildings will have a low impact, in accordance with BS4142:2014+A1:2019 and guidance from the Association of Noise Consultants' BS 4142:2014+A1:2019 Technical Note (March 2020, Version 1.0).

The cumulative plant noise levels are lower than the guideline limits provided in HTM 08-01, and therefore the impact of noise from the plant on the hospital itself is also expected to be low.

The predicted plant noise levels meet the BREEAM requirement for plant noise during daytime hours. During the night time period the predicted plant noise levels exceed the BREEAM requirement by 1dB at the rear of a single residential dwelling closest to the new building (the predicted noise levels at all other receptors meet the night time Pol 05 requirement). The aim of Pol 05 is *"To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings"*. On the basis that the BS 4142:2014+A1:2019 assessment indicates a low impact, I consider the aim of Pol 05 to have been achieved. In addition, a difference of 1dB is negligible in acoustic terms and is unlikely to be noticeable by the human ear. I therefore recommend that the Pol 05 credit is awarded.

Contents

Summary.....	3
Contents.....	4
1.0 Introduction.....	5
2.0 Noise Policy and Guidance	6
3.0 Noise Survey	8
4.0 Plant Items.....	9
5.0 Noise Impact Assessment.....	10
Appendix A – Plant Noise Data	17
Appendix B – Attenuator Performances.....	19

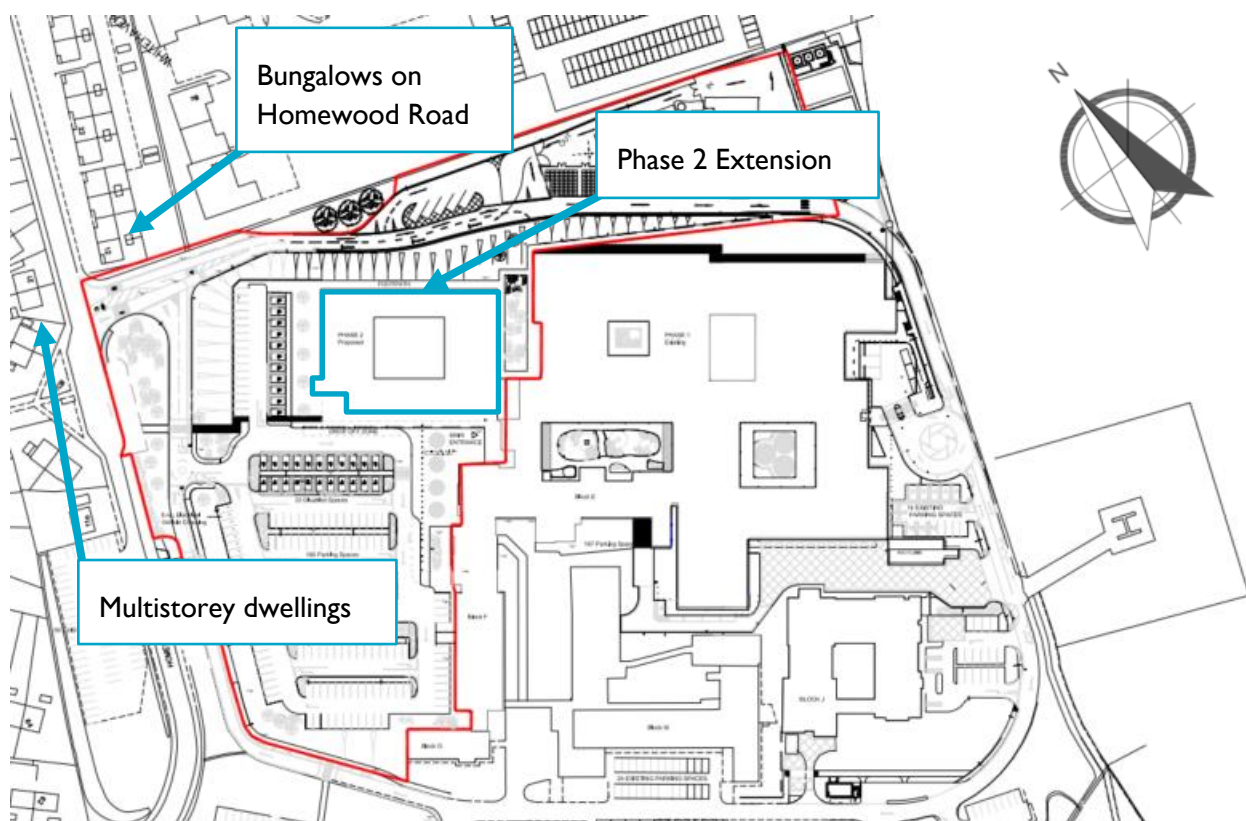
1.0 Introduction

A new build extension is being constructed as part of the Phase 2 redevelopment of West Cumberland Hospital for the North Cumbria University Hospitals NHS Trust. The new 2 storey building will connect to the existing Phase 1 building (completed in 2015).

A planning condition relating to noise from building services plant has been attached to the new development. SRL Technical Services has assessed the noise impact of the proposed plant on the nearest noise sensitive receptors to satisfy the requirements of the condition.

The nearest sensitive receptors (NSR) are bungalows on Homewood Road located north of the extension. There are also multistorey dwellings located at a further distance, on the opposite side of Homewood Road.

Figure 1 - Nearest noise sensitive receptors



2.0 Noise Policy and Guidance

2.1 Planning condition 10: “Noise”

Planning condition 10 of the decision notice for the proposed development states the following:

“No development shall commencement until details of any external plant to be installed and an assessment of the noise impact of the proposed development on existing residential dwellings has been submitted to and approved in writing by the local planning authority. The assessment shall address the potential for noise to occur which may impact upon the amenity of the occupier(s) of the dwellings and shall identify fully all measures which are required to control the impact of that noise.

All approved control measures shall be implemented prior to first occupation of the building and shall be retained as such thereafter. A verification report shall be submitted to and approved in writing by the local planning authority confirming that all measures in the approved assessment have been implemented in full prior to first occupation of the building.

Reason

To protect the amenity of adjacent residential properties in accordance with the provisions of Policy ST1 of the Copeland Local Plan 2013-2028.”

2.2 British Standard 4142:2014+A1:2019 - ‘Methods for rating and assessing industrial and commercial sound’

BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ provides a method to assess whether “sound of an industrial and/or commercial nature” is likely to have an adverse impact at noise sensitive receptors, in particular existing housing.

BS 4142’s assessment methodology considers how loud the noise is and its character (e.g. whether it contains hisses, bangs or clicks). The assessment is then based on how loud (and how annoying) the source noise is compared with the existing background noise at the receptor.

The following corrections can potentially be applied for the acoustic character:

Tonality – a correction of up to +6 dB can be applied depending on how tonal the specific noise is.

Impulsivity – a correction of up to +9 dB can be applied if the noise is impulsive.

If the source is both tonal and impulsive it is usual to only apply the correction for the characteristic which is most dominant.

Intermittency – when the noise source has identifiable on/off conditions (e.g. an item of plant which switches on and off), and these on/off conditions are readily distinguishable against the residual acoustic environment, a correction of up to +3 dB can be applied in addition to any Tonality correction.

Other sound characteristics – where the noise source is not tonal or impulsive but has another characteristic that is readily distinguishable against the residual acoustic environment, a correction of up to +3 dB can be applied.

The rating level is determined by applying these corrections to the specific level. The rating level can then be compared with the measured background level. The difference between the rating level and the typical background level can then be interpreted using the following guidance from BS 4142, depending on the context:

- If the Rating Level is +10 dB or more above the background level, this indicates a significant adverse impact.
- A difference of around +5 dB is likely to be an indication of an 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.

2.3 Health Technical Memorandum 08-01

HTM 08-01 provides the following guidance for building services noise in external areas of hospitals:

“Open external areas should be protected. Noise from services should not exceed the existing daytime background noise level or 50 dB LA90, whichever is the higher. This limit should be achieved in any areas normally occupied by staff (except maintenance staff, notwithstanding the requirements of the Control of Noise at Work Regulations 2005) or the public (for example open courtyards and accessible landscaped areas). This means that noisy plantrooms should not face normally occupied external areas unless adequate acoustic control is provided.”

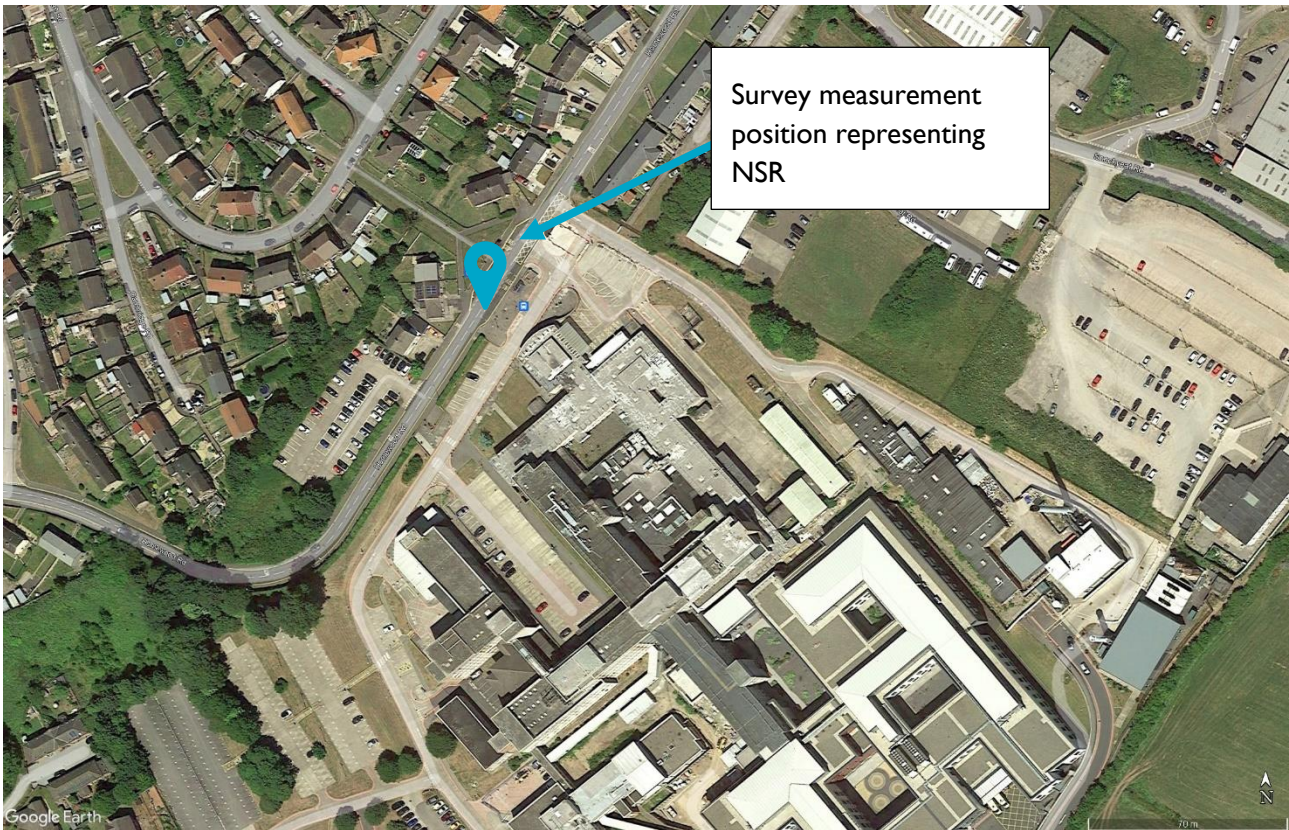
2.4 BREEAM New Construction 2014 Pol 05 - Reduction of noise pollution

One credit is available where noise level from plant associated with the new development is no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level.

3.0 Noise Survey

SRL Technical Services measured noise levels at the site on 12th February 2021, following the noise survey done by Wardell Armstrong in November 2019. The lowest background noise levels from both surveys have been used for this assessment, to provide a worst case scenario. Below shows the measurement position used to represent the nearest noise sensitive dwellings to the phase 2 extension where the proposed plant is located.

Figure 2 - Survey measurement position



The background noise levels in Table I have been used in this assessment. These are the typical lowest measured background noise levels from both SRL and Wardell Armstrong’s noise surveys.

Table I – Typical lowest measured background noise levels

Noise Sensitive Receptor Location	Daytime Background Noise Level, dB LA90 (07:00hrs to 23:00hrs)	Night-time Background Noise Level LA90 (23:00hrs to 07:00hrs)
Existing residential on Homewood Road	49	30

4.0 Plant Items

The following items of plant have been assessed:

- Roof Mounted Plant
 - 2no. chillers
 - 1no. extract fan
- Internal plant ducted to the façade
 - 5no. air handling units
 - 4no. heat pumps (Condensers)

Detailed noise information for these plant items are found in Appendix A.

The proposed plant is expected to be running at anytime in a 24-hour period and therefore our assessment calculates noise impact during both day and night-time periods.

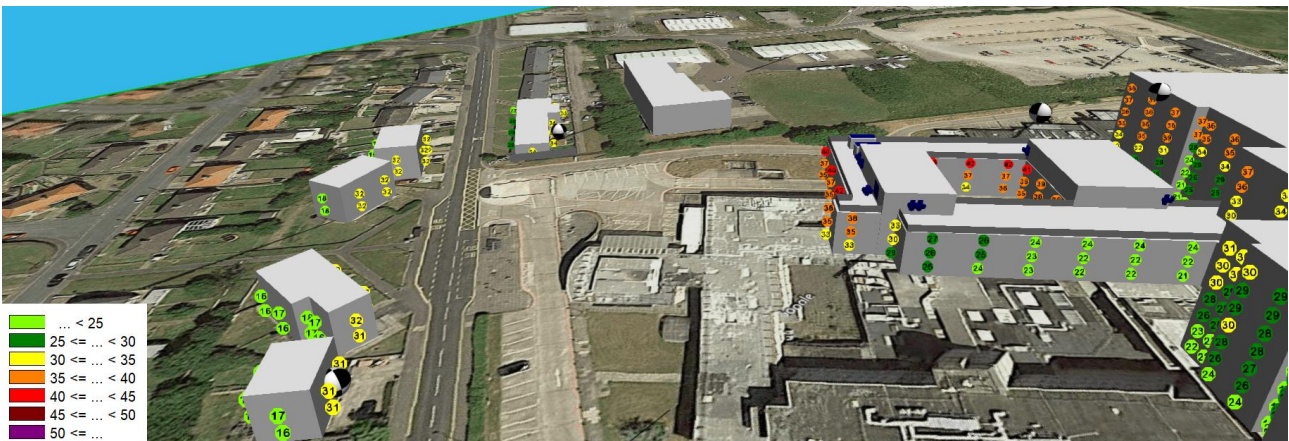
The chiller works on Duty/Resilience so the 2nd chiller will mostly be duty/standby but could operate for a short period of time to bring temperatures back down. This is only likely to occur during daytime hours so our assessment allows for two chillers operating during the daytime and one chiller operating at night. In addition the chillers will only operate at 50% load so we have applied a 5 dB reduction to the noise levels which were provided by the manufacturer for the chillers to account for the lower operating duty.

5.0 Noise Impact Assessment

5.1 Noise modelling

We have created a 3D noise model of West Cumberland Hospital, the proposed plant and the nearest residential dwellings using CadnaA 3D noise propagation software.

Figure 3 - Cadna 3D noise model



We have produced noise maps of the surrounding area, shown below, to calculate the noise levels at the nearest dwellings during the day and night-time.

Figure 4 - Daytime noise map, contours at 1.5m ($L_{Aeq,T}$ dBA)

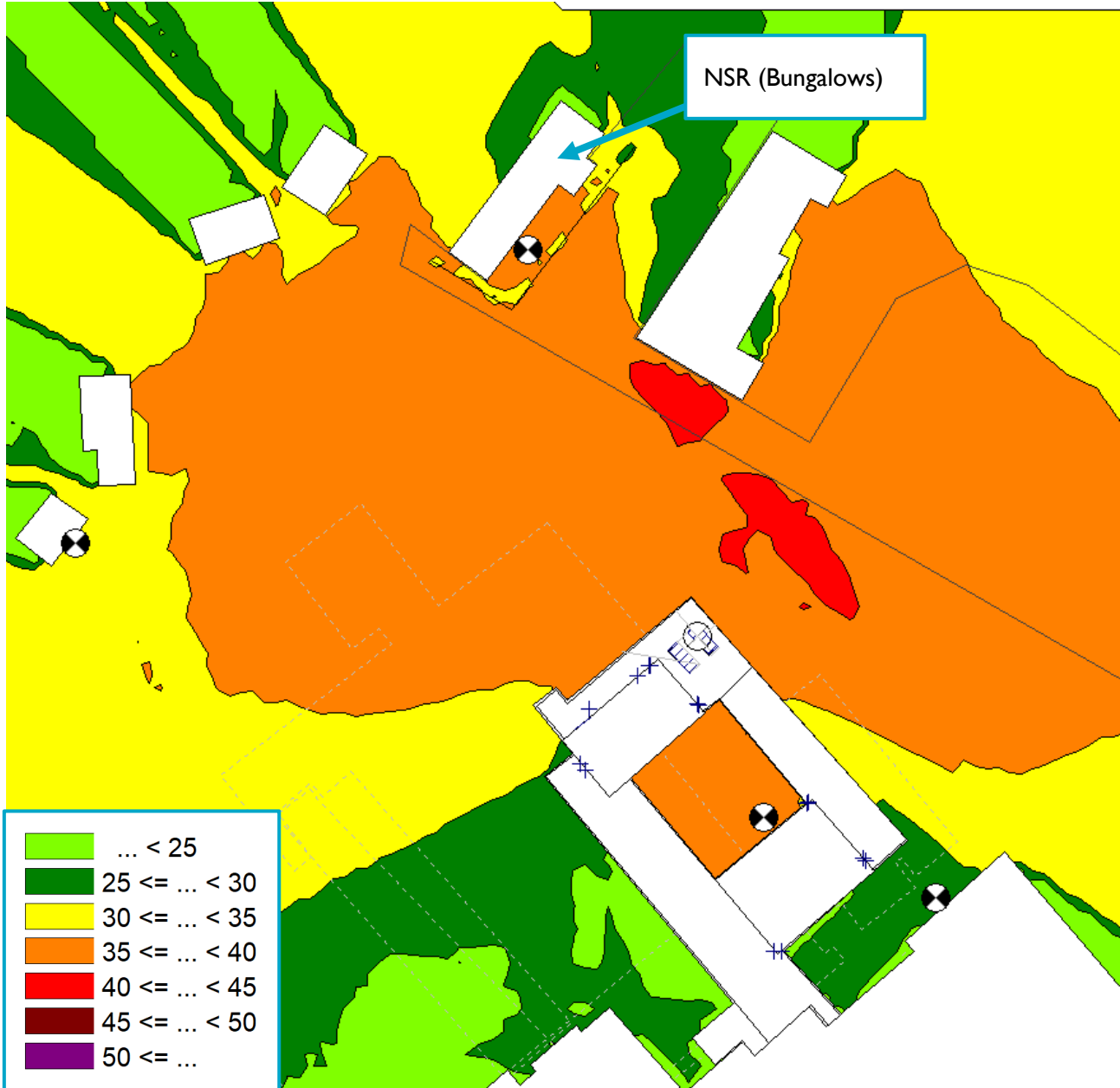


Figure 5 - Night-time noise map, contours at 1.5m ($L_{Aeq,T}$ dBA)

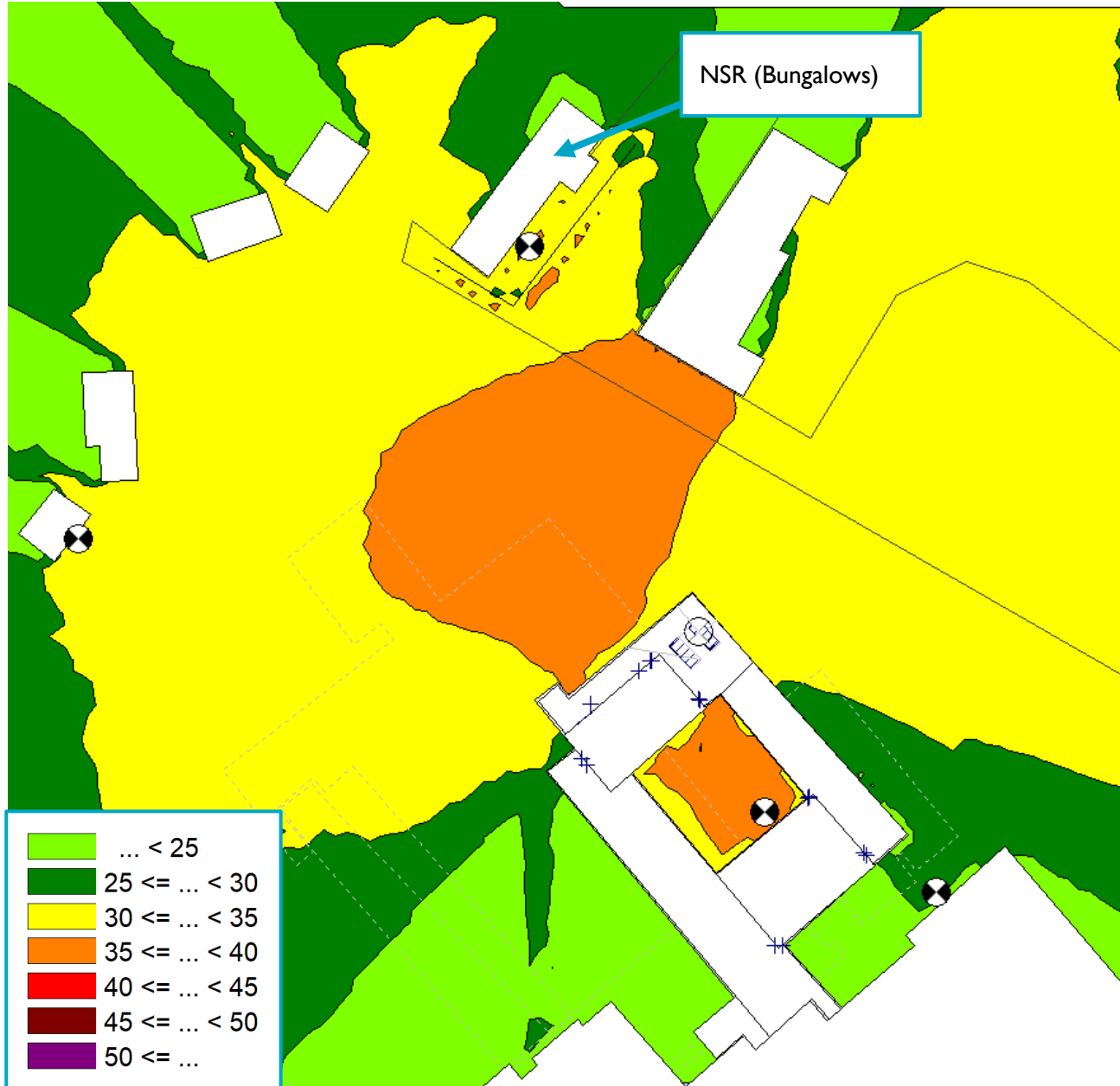


Figure 6 – Predicted night time noise levels at the nearest residential buildings



Figure 6 above shows the calculated noise levels at the nearest residential buildings, which is up to 36 dBA during daytime hours and 34dBA during night time hours at the bungalows on Homewood Road.

5.2 BS4142:2014+A1:2019 Plant noise assessment

Tables 3 and 4 below show the BS4142 assessment of the calculated plant noise levels at the nearest noise sensitive receptors, during the day and night.

Table 2 - BS4142:2014+A1:2019 assessment (daytime)

Calculated Specific Noise Level (dB $L_{Aeq,1hr}$)	36
Acoustic Character Correction (dB)	0*
Plant Noise Rating Level (dB $L_{Ar,Tr}$)	36
Typical Daytime Background Noise Level (dB $L_{A90,1hr}$)	49
Difference (dB)	-13
BS 4142 noise impact assessment	Low

Uncertainty of the assessment	Lowest typical background noise levels from both SRL and Wardell Armstrong’s noise surveys were used for assessment and therefore the uncertainty in the result will be low.
-------------------------------	--

* No acoustic character corrections applied due to the context of this site where noise from building services plant associated with other hospital buildings at the site is already being experienced at the nearest noise sensitive receptors. Therefore the new plant associated with Phase 2 is unlikely to add any additional acoustic features which aren’t already present.

The daytime background noise levels are higher than the rating level of the plant at the nearest residential buildings, therefore in accordance with BS 4142 this is an indication that noise from the proposed plant will have a low impact.

Table 3 - BS4142:2014+A1:2019 Plant noise assessment (nighttime)

Calculated Specific Noise Level (dB $L_{Aeq,15min}$)	34
Acoustic Character Correction (dB)	0*
Plant Noise Rating Level (dB $L_{Ar,Tr}$)	35
Typical Daytime Background Noise Level (dB $L_{A90,15min}$)	30
Difference (dB)	+4

* No acoustic character corrections applied due to the context of this site where noise from building services plant associated with other hospital buildings at the site is already being experienced at the nearest noise sensitive receptors. Therefore the new plant associated with Phase 2 is unlikely to add any additional acoustic features which aren’t already present.

The assessment shows that the noise rating level at the nearest noise sensitive receptor exceeds the background noise level during the night-time.

In this case, the measured background noise levels are low. BS4142 states 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.” It may therefore be more appropriate to define absolute limits from plant and services, subject to context.

The BS 4142:2014+A1:2019 Technical Note (March 2020, Version 1.0) produced by the Association of Noise Consultants states that: “BS 4142 does not define ‘low’ in the context of background sound levels nor

rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90} , and low rating levels as being less than about 35 dB $L_{Ar,Tr}$.” This suggests that the background and the rating levels can be considered ‘low’ from the scope of the 1997 version of BS 4142.

Therefore on the basis that the background noise levels and the rating level of the proposed plant are considered to be low, and considering the context of the environment that the plant is proposed where existing plant is present, we expect that noise from the proposed plant will have a low impact at the nearest noise sensitive receptors and therefore additional mitigation is not required.

5.3 Noise impact on the hospital

Health Technical Memorandum 08-01 (HTM 08-01) guidelines state: “Noise from services should not exceed the existing daytime background noise level or 50 dB L_{A90} , whichever is the higher.” The highest predicted plant noise levels are 47dB L_{Aeq} at the new Phase 2 building and 40dB L_{Aeq} at existing hospital buildings as shown in Figure 7.

Figure 7 – Predicted noise levels at the hospital buildings



5.4 BREEAM Pol 05

BREEAM Pol 05 requires the noise level from plant associated with the new development to be no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level.

Our predicted daytime plant noise level is 12dB below the background noise level during the daytime which meets the Pol 05 requirement at all receptors.

During the night time we predict plant noise to be 4dB higher than the background noise level at the rear of a single bungalow closest to the new building as shown in Figure 8. This exceeds the Pol 05 requirement by 1dB. The predicted noise levels at all other receptors meet the night time Pol 05 requirement.

Figure 8 – Predicted night time noise levels at nearest noise sensitive receptors



The aim of Pol 05 is “To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings”. On the basis that the BS 4142:2014+A1:2019 assessment indicates a low impact, I consider the aim of Pol 05 to have been achieved. In addition, a difference of 1 dB is negligible in acoustic terms and is unlikely to be noticeable by the human ear. I therefore recommend that the Pol 05 credit is awarded.

Appendix A – Plant Noise Data

Item ref	Noise Source	Octave Band Levels (dB)							
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
AHU 01	Supply (inlet)	79	82	79	74	70	69	68	67
	Extract (outlet)	77	79	77	77	79	74	68	62
AHU 02	Supply (inlet)	78	81	78	73	69	68	67	66
	Extract (outlet)	76	78	76	76	78	73	67	61
AHU 03	Supply (inlet)	75	77	83	76	71	68	65	58
AHU 04	Supply (inlet)	77	80	77	72	68	67	66	65
	Extract (outlet)	75	77	75	75	77	72	66	60
AHU 05	Supply (inlet)	78	81	78	73	69	68	67	66
	Extract (outlet)	76	78	76	76	78	73	67	61
CH01	Chiller	98*	92*	91*	88*	86*	82*	79*	79*
CON-01	Heat pump (condenser)	-	-	-	-	49	-	-	-
CON-02	Heat pump (condenser)	-	-	-	-	49	-	-	-
CON-03	Heat pump (condenser)	-	-	-	-	49	-	-	-

Item ref	Noise Source	Octave Band Levels (dB)							
		63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
CON-04	Heat pump (condenser)	-	-	-	-	49	-	-	-
EF-01	Extract fan	85	82	81	80	73.5	73	71	67

* Octave band sound pressure level spectrum provided by the manufacturer has been adjusted to equal the manufacturer quoted sound power level of 91 dB(A) L_w, minus 5dB for a typical 50% operating duty.

Appendix B – Attenuator Performances

Item ref	Octave Band Insertion Loss (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
PR1/ATT/01 PR1/AHU01 EXH	13	23	34	45	50	44	37	25
PR1/ATT/02 PR1/AHU01 FAI	7	11	17	22	30	21	17	11
PR1/ATT/06 PR1/AHU02 FAI	7	11	17	22	30	21	17	11
PR1/ATT/07 PR1/AHU02 EXH	9	15	23	32	41	29	25	16
PR1/ATT/11 PR1/AHU03 FAI	8	12	19	26	31	28	22	14
PR2/ATT/01 PR2/AHU04 EXH	8	14	21	29	38	26	22	13
PR2/ATT/02 PR2/AHU04 FAI	7	11	17	22	30	21	17	11
PR2/ATT/05 PR2/AHU05 EXH	8	14	21	29	38	26	22	13
PR2/ATT/06 PR2/AHU05 FAI	7	11	17	22	30	21	17	11

**Sudbury Consultancy**

Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TF
Tel: +44 (0)1787 247595

Manchester Consultancy

Suite 1.9, Canada House
Chepstow Street
Manchester
M1 5FW
Tel: +44 (0)161 929 5585

South Africa Consultancy

102 Heritage House
20 Dreyer Street
Claremont
Cape Town
7708
South Africa
Tel: +27 (0)21 205 9201

Laboratory

Holbrook House
The Street
Sudbury
Suffolk
CO10 0TF
Tel: +44 (0)1787 247595

Website: www.srltsl.com
e-mail: srl@srltsl.com

SRL offers services in:

Acoustics
Air Quality
BREEAM
Laboratory and Site Testing

Registered Name and Address:

SRL Technical Services Limited
Holbrook House
Little Waldingfield
Sudbury
Suffolk
CO10 0TF

Registered Number: 907694 England

