



Neath Port Talbot Hospital
Baglan Way, Port Talbot SA12 7BX

Noise Impact Assessment

25th February 2022
First Issue



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ParkerJones Acoustics Limited

Bristol

11 Bankside Road
Brislington
Bristol
BS4 4LB

London

29 Lincoln's Inn Fields
Holborn
London
WC2A 3EE

Glasgow

126 West Regent Street
Glasgow
G2 2RQ

+44 (0)800 830 3338

+44 (0)117 914 6558

info@parkerjonesacoustics.com

www.parkerjonesacoustics.com

Registered in England and Wales

Company No. 12235614

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Executive Summary and Conclusions

This document has been written to assess the impact of noise 'pollution' generated by the proposed erection of a new 2-storey building with rooftop plant at Neath Port Talbot Hospital, Baglan Way, Port Talbot SA12 7BX.

This is based upon ensuring that the noise emissions from the development will not cause a significant increase in existing background noise levels outside noise-sensitive receptors (residential properties) in the surrounding area, once it is fully operational.

Therefore, the noise emissions from the proposed development have been assessed at a high level following a BS 4142:2014+A1:2019 methodology, based upon existing background noise levels determined by a baseline noise survey, and subsequent predictions of the noise emissions using a detailed 3D noise model. This is a high level/indicative assessment based partially open the plant design from another recently constructed hospital in Swansea that PJA assessed, given that the plant has not been fully designed at this early pre-planning permission stage of the project.

As seen in **Section 5.0**, maximum plant noise rating limits have been set based upon not exceeding the minimum background sound levels determined over a 6-day long survey, that is, 44 dB $L_{A,r,Tr}$ during the day, and 41 dB $L_{A,r,Tr}$ at night. The indicative assessment results in a rating level of 38 dB, within these limits, calculated 1m from the façade of the nearest/worst-affected residential properties. This in principle demonstrates that the proposed development can operate with an acceptably low noise impact on residential properties.

Evidentially, this is based upon an indicative scenario. It should also be recognised that mitigation may be necessary to reduce the noise impact on the new building itself, as well as the surrounding hospital, and not just nearby residents. PJA has covered what this mitigation may be in **Section 5.3**.

It is seen to be the responsibility of the developer and design team involved with the mechanical plant design to ensure that the rating levels herein not exceeded. It must be remembered that the rating level included for plus the addition of any 'penalties' which account for the characteristic features of the sound which may attract attention to it, such as tonality, impulsivity, intermittency, and any other sound characteristics that *"are readily distinctive against the residual acoustic environment"*.

In summary, plant noise emissions should not pose a significant constraint on the proposed development and the site location is considered suitable in this respect. PJA recognise that this aspect is likely to be conditioned within any planning approval with the requirement for a further assessment to be submitted to the Council to demonstrate that the noise limits will be achieved, once the project reaches the technical design stage and the design of the plant has been finalised.

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1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to undertake a Noise Impact Assessment (NIA) as part of the planning application for the erection of a new 2-storey building with rooftop plant at Neath Port Talbot Hospital, Baglan Way, Port Talbot SA12 7BX.

1.1 Scope of Report

This NIA Report has been written to assess the impact of noise 'pollution' generated by the proposed development on noise-sensitive receptors (residential properties) in the surrounding area, once it is fully operational. The objective is to ensure that the risk of noise impact will be controlled sufficiently. This is based upon ensuring that the noise emissions from the development (predominantly from plant) will not cause a significant increase in existing background noise levels outside nearby residential properties once operational.

Therefore the purpose of this report is to determine what the existing ambient noise levels are at the site and surrounding residential receptors (based upon an environmental noise survey), and then set noise rating level limits which must not be exceeded by plant noise emissions.

As the design of the mechanical plant/ventilation system will be fully developed at a later stage, it is anticipated that noise rating level limits herein will be conditioned, with compliance demonstrated once the design has been progressed further.

Whilst every attempt has been made to ensure that this report communicates effectively to a reader who might not have much knowledge of acoustics, some parts are necessarily technical. A glossary of acoustic terminology and concepts is provided in **Appendix A**.

1.2 Regulations and Guidelines

The assessment has been made with reference to several guidelines, including TAN 11 - 'Technical Advice Notes (Wales) 11, Noise – October 1997', and BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*', which assesses the risk of adverse impact of noise pollution from a sound source (or sources) of a commercial or industrial nature.

These standards are commonly used across the UK to assess noise impacts on residential properties, and impacts arising from noise sources of a commercial/industrial nature.

2.0 Site and Development Description

As shown in **Figure 2.1**, the proposed new building (easting: 275440, northing: 190539) is on a small parcel of land sandwiched between two existing buildings at the hospital.

Most of the surrounding land is occupied by hospital buildings, with residential properties to the north/east along Rhodes Avenue, the closest of which will be approximately 65m from the edge of the new building. The site is approximately 300m south-west of the M4.

The proposals at this stage are for the construction of a new 2-storey building which will house a mix of spaces including operating theatres, assessment rooms, a seminar room, and staff/ancillary spaces, as shown in **Figures 2.2** and **2.3**. It is understood that there will be enclosed plant rooms on the north side of both ground and first floors, with chiller units externally – albeit the plant design is at an early stage and likely will not progress to a detailed stage until planning permission has been granted.

PJA also note that an application was recently approved (ref: P2019/5019) directly adjacent to the proposed building location for the “installation of a new MRI magnet and AHU equipment including associated ductwork and alterations to adjacent footway”. No noise-related planning conditions were applied to the planning approval.

Figure 2.1 – Site location and surrounding area



Figure 2.2 – Ground floor plan

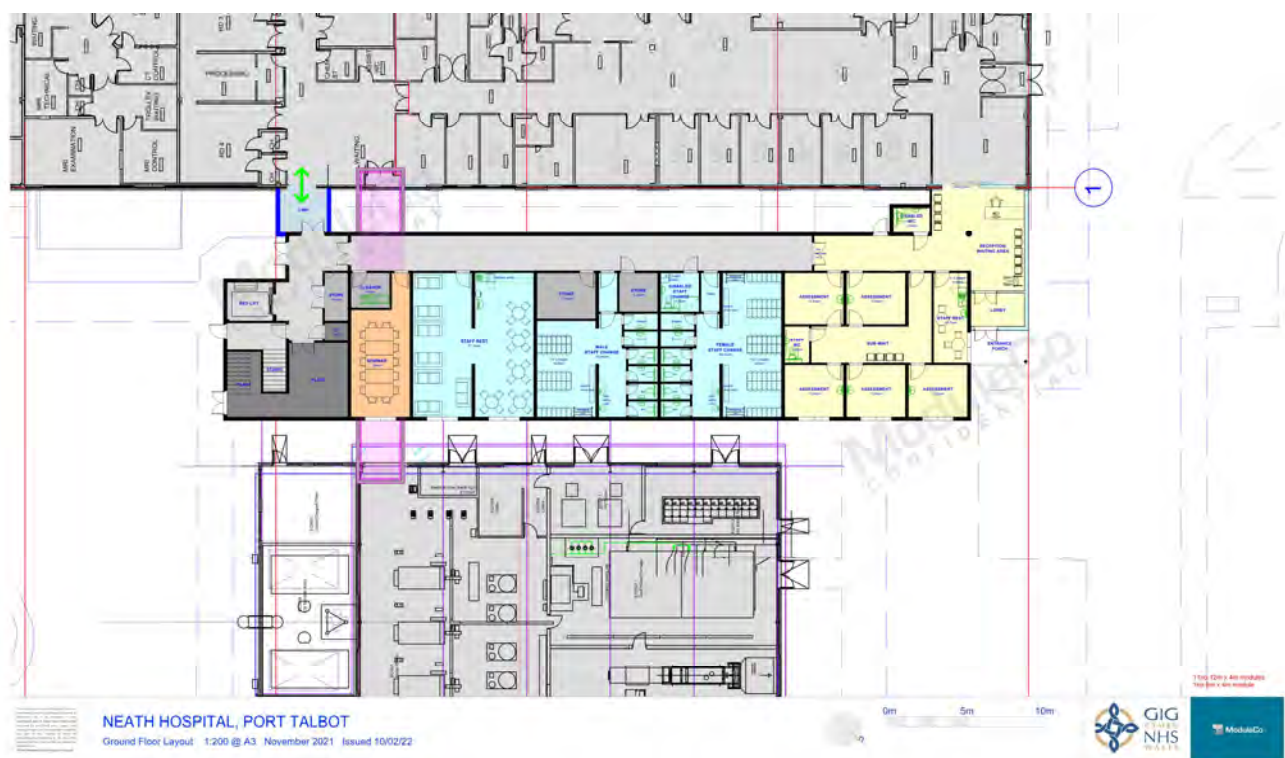


Figure 2.3 – First floor plan



3.0 Relevant Guidelines

3.1 Technical Advice Note 11 (TAN 11)

'Technical Advice Notes (Wales) 11, Noise – October 1997' gives guidance on the control of noise to sensitive developments which may be affected by noise and vice versa. With regards to noise generation from industrial sites, it states:

"B17. The likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS 4142: 1990. Tonal or impulsive characteristics of the noise are likely to increase the scope for complaints and this is taken into account by the "rating level" defined in BS 4142. This "rating level" should be used when stipulating the level of noise that can be permitted. The likelihood of complaints is indicated by the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise.

The Standard states that, 'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance'. Since background noise levels vary throughout a 24 hour period it will usually be necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the proposed development. Similar considerations apply to developments that will emit significant noise at the weekend as well as during the week. In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233:1987."

3.2 BS 4142:2014

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations (i.e. residential windows) within the context of the existing sound environment.

The method is based upon assessing the predicted noise emissions from plant/equipment against the existing background sound levels at NSRs, the latter of which is determined by a noise survey conducted at the site.

The predicted noise emissions are termed as a 'rating level', which is the 'specific sound level' from plant (the actual measurable noise level), plus 'penalties' which account for whether the noise has distinguishing characteristics such as tonality, intermittency, impulsivity, or is generally distinguishable from the ambient noise environment. Such features may attract attention and be considered annoying, hence sounds with these qualities should be penalised over sounds at the same specific noise level which is less intrusive.

The general aim is for the 'rating level' (plant noise emissions) to not exceed the existing background sound levels outside of residential windows. BS 4142:2014 states 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 sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Appendix B explains the methodology in further detail.

3.3 Typical Planning Conditions

PJA are not aware of specific guidance from the Local Planning Authority which outlines a standard approach to noise assessments/noise limits.

However, from reviewing planning applications for other installations of mechanical plant, the typical condition appears to be along the lines of the following.

"The noise rating level emitted from air conditioning plants shall not be greater than the existing background noise level. The noise levels shall be determined at the nearest noise-sensitive premises or at another location that is deemed suitable by the Local Planning Authority. Measurements and assessments shall be made in accordance with "BS 4142:2014 Method for rating and assessing industrial and commercial sound. In the event of a justified noise complaint being received, the Local Authority shall require the applicant to undertake a noise assessment in accordance with BS4142, the methodology of which shall be first agreed in writing with the Local Authority. A copy of the completed noise assessment report shall be submitted to and approved in writing by the Local Authority, and if the report includes recommendations, the recommendations shall be fully implemented on-site in accordance with an agreed timetable. Reason: To protect the amenity of the locality, especially for people living and/or working nearby, and to comply with Policy BE1 of the Neath Port Talbot Local Development Plan."

4.0 Baseline Noise Survey

4.1 Methodology

PJA has attended the site and surrounding area to conduct a baseline noise survey between Thursday the 17th of February and Wednesday the 23rd of February 2022.

The results have been used to determine a representative background sound level (L_{A90}) in accordance with BS 4142:2014, and typical ambient noise levels (L_{Aeq}) for assessment against other relevant standards - at a position representative of the background sound levels at the boundary of nearest/worst-affected residential property.

A single monitoring position was employed with a sound level meter installed close to the boundary of the site towards the nearest residential properties – the location of which is shown in **Figure 2.1 (Section 2.0)**. The microphone was positioned at a height of approximately 1.5m.

The sound level meter was set to log noise levels over continuous 15-minute averaging periods with a 1-second time history rate. The monitoring equipment was left unattended for the majority of the survey with the exception for a short period around the installation and collection of the sound level meter. The following noise indices were recorded (amongst others):

- $L_{A90,T}$: The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level' and is therefore used in determining the representative background noise level.
- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period T. This parameter is typically considered as a good representation of the average ambient sound level; and
- $L_{AFmax,T}$: The maximum A-weighted noise level during the measurement period T.

Appendix C contains further information on the methodology of the survey including photographs taken from site and the equipment used.

4.2 Results

A graph of the measured noise levels across the entire monitoring period is given in **Figure 4.1** overleaf.

Table 4.1 summarises the results across the daytime (07:00 – 23:00), and night-time (23:00 – 07:00) periods respectively, accumulated across the several days that the survey spanned over.

It is noted that wind speeds were exceptionally high for large periods during the first few days of the survey in particular and that ambient noise levels during this period were generally not representative. However, the length of the survey ensured that representative levels could be captured during periods of lesser/normal wind speeds. As the assessment is based upon the *minimum* background sound levels (the lowest $L_{A90,15min}$ value across the entire survey), the adverse weather conditions/inflated noise levels during the first few days can be ignored.

The most relevant parameter in terms of the 'representative background sound level' referenced in BS 4142:2014 is the $L_{A90,15min}$. **Figures 4.2** and **4.3** present histograms of the $L_{A90,15min}$ values during daytime and night-time hours, showing minimum values of 44 dB and 41 dB.

Table 4.1 – Summary of measured noise levels at the monitoring position

Period	Parameter	Maximum	Minimum	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,15min}$ (dB)	74	46	58	59	57
	$L_{AFMax,15min}$ (dB)	91	51	73	75	72
	$L_{A90,15min}$ (dB)	63	44	53	54	54
Night-time (23:00 – 07:00)	$L_{Aeq,15min}$ (dB)	67	43	51	49	50
	$L_{AFMax,15min}$ (dB)	87	47	64	60	63
	$L_{A90,15min}$ (dB)	58	41	47	47	47

Figure 4.1 – Time history of measured noise levels

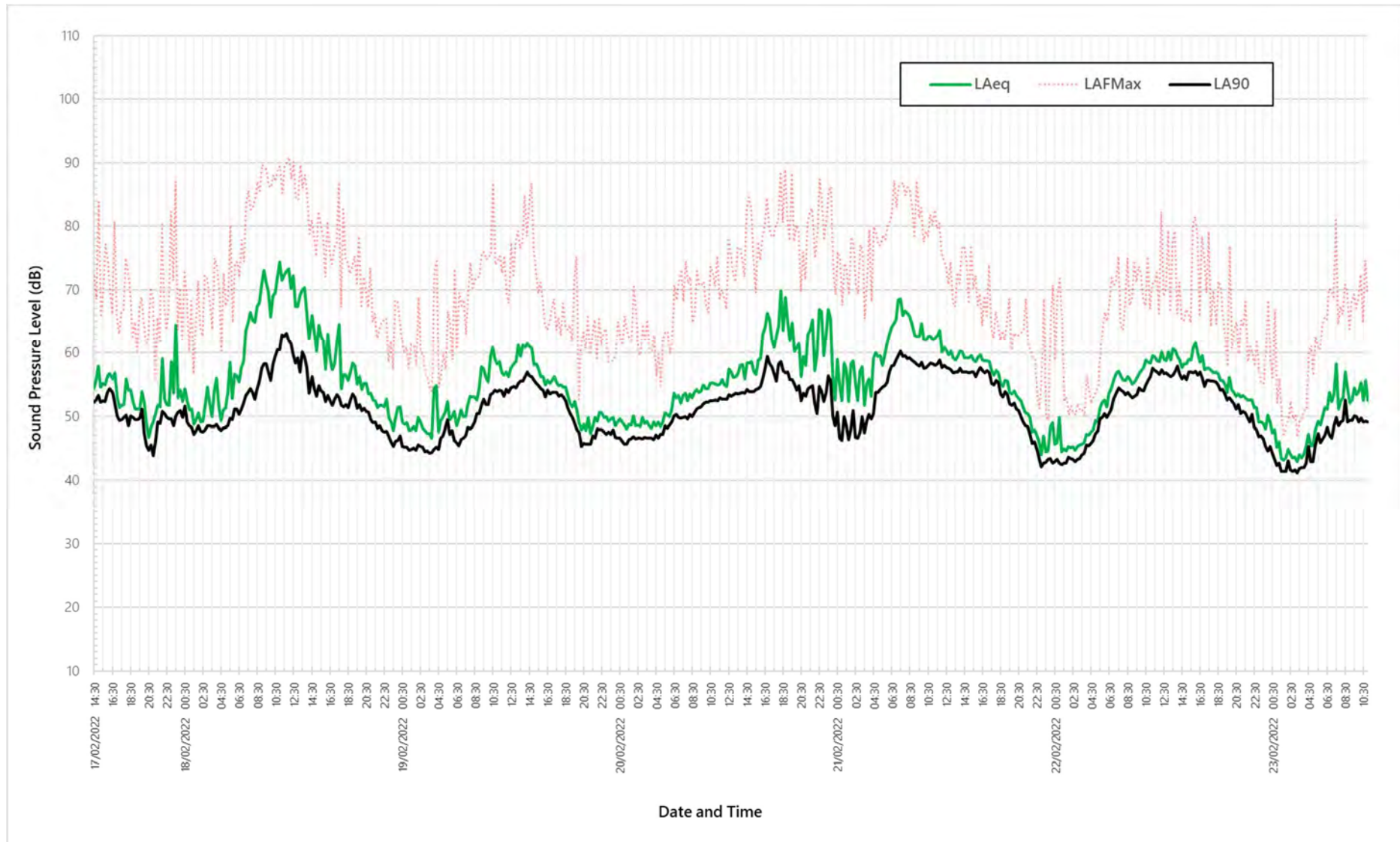


Figure 4.2 – Histogram of L_{A90} noise levels – daytime (07:00 – 23:00)

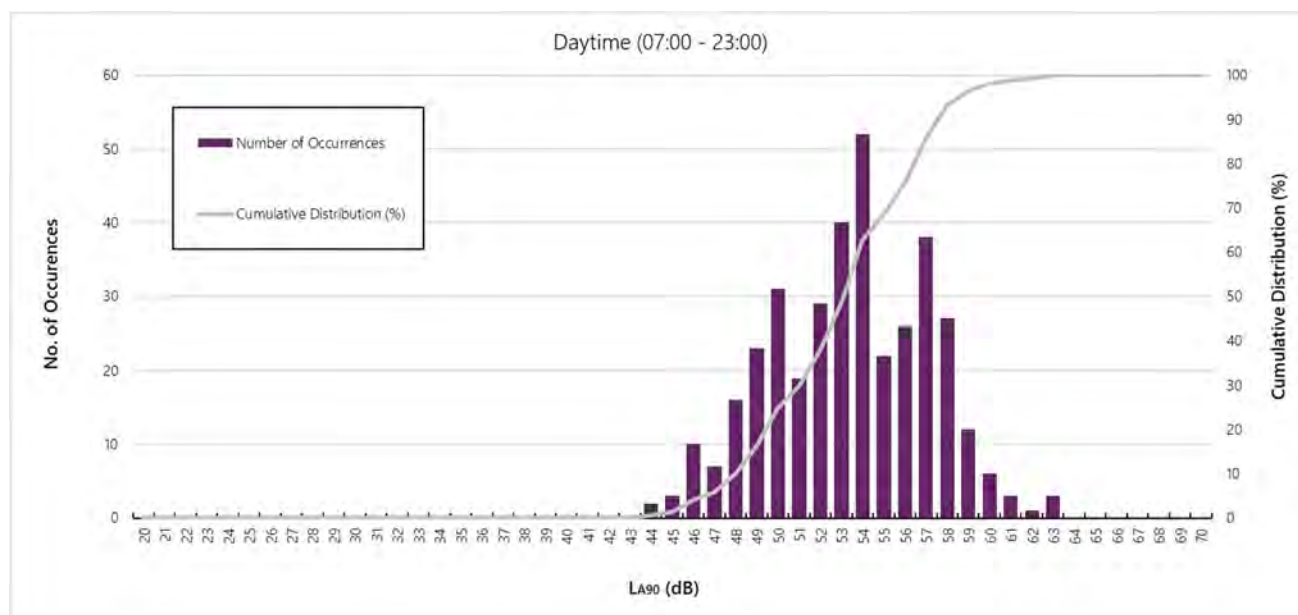
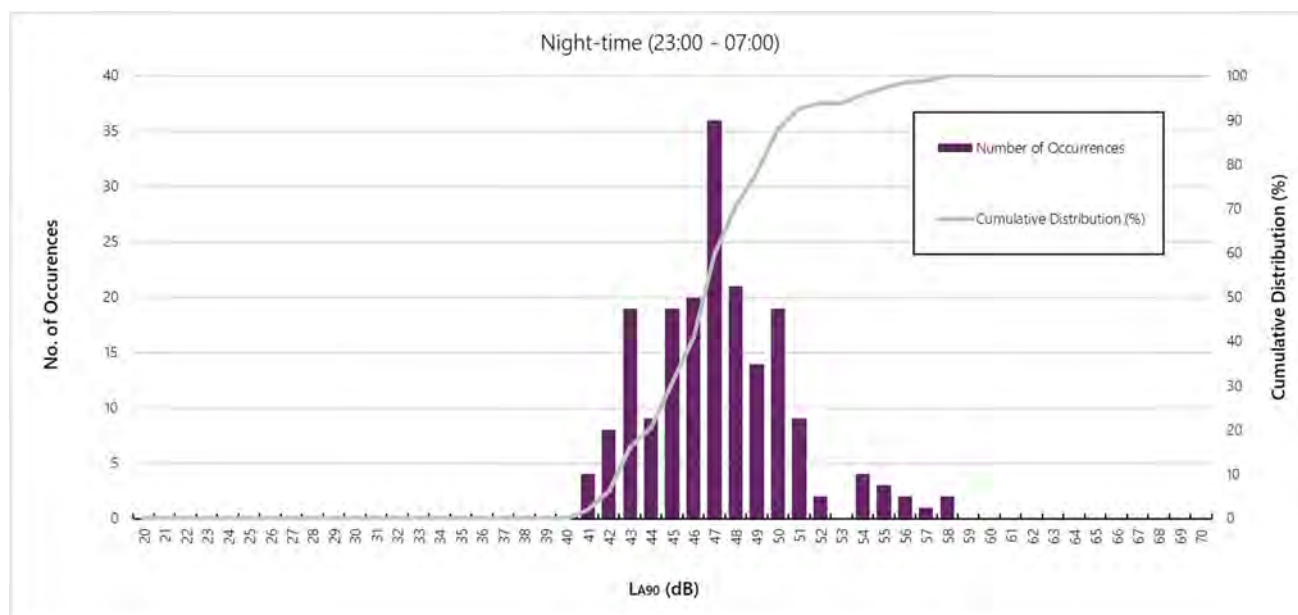


Figure 4.3 – Histogram of L_{A90} noise levels – night-time (23:00 – 07:00)



5.0 Assessment

The assessment of the noise impact on nearby residential noise-sensitive receptors (NSRs) concerning the operational noise produced by the proposed development should be undertaken in accordance with BS 4142:2014.

At the time of writing the mechanical plant design had not been fully developed.

Therefore, the assessment at this stage is based upon setting a *rating level* L_{A,r,T_r} for noise emissions from plant based upon the existing *background noise level*, L_{A90,T_r} . The rating level is the *specific noise level* L_s plus the addition of any 'penalties' which account for the characteristic features of the sound which may attract attention to it, such as tonality, impulsivity, intermittency, and any other sound characteristics that *"are readily distinctive against the residual acoustic environment"*.

It will then be the responsibility of the developer and design team involved with the mechanical plant design to ensure that the proposed rating levels are not exceeded.

The operational hours of any such proposed plant are currently unknown, therefore, plant limits for day and night-time have been set.

5.1 Background Sound Levels

In accordance with BS 4142:2014, the predicted rating level should be assessed against a 'representative' background sound level.

For a worst-case assessment, the minimum values of the background sound level $L_{A90,15mins}$ of the survey have been set as the representative background sound level - see **Table 5.1**.

Table 5.1 – Derived representative background sound level $L_{A90,T}$ at nearby residential NSRs

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level $L_{A90,T}$ (dB)
All nearby residential properties	Daytime (07:00 to 23:00)	44
	Night-time (23:00 – 07:00)	41

5.2 Maximum Rating Levels

In accordance with BS 4142:2014, the predicted rating level should be assessed against a 'representative' background sound level.

BS 4142:2014 states in general 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 sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

PJA recognise that a rating level limit is often subject to a planning condition. Typically, as per **Section 3.3**, this condition is based upon the rating level from plant being below the representative background sound level. Therefore, PJA proposes the rating level limits given in the table below.

Table 5.2 – Maximum rating level L_{A,r,T_r} for all nearby residential windows

Noise-Sensitive Receptor	Period	Representative Background Sound Level L_{A90,T_r} (dB)	Maximum Rating Level L_{A,r,T_r} at 1m from the outside of the all residential windows (dB)
All nearby residential properties	Daytime (07:00 to 23:00) $T_r = 60$ -minutes	44	44
	Night-time (23:00 – 07:00) $T_r = 15$ -minutes	41	41

5.3 Proposed Plant / Site Suitability

At this stage, the plant design has not been fully developed. The indicative design suggests:

- A chiller or chillers located externally;
- A large plant room on the ground floor on the south-eastern corner of the building, with a double external door on the south elevation as seen in **Figure 2.2**;
- A smaller IT plant room on the 1st floor, on the east elevation, set back from the south elevation as seen in **Figure 2.3**.

The external chillers are likely to be the most significant noise emitter, followed to a lesser extent by the ground floor plant room, depending on the plant within it and whether the external wall or door contains louvres. Noise emissions from the smaller IT plant room are likely to be negligible (noise from server related equipment is relatively low in comparison to mechanical plant which may be within the larger plant room such as pumps, condensers, AHUs, etc).

PJA has recently assessed a nearby hospital development – Sancta Maria Hospital (ref: 2017/2610/FUL – Cyngor Abertawe Swansea Council), with similar rooms (i.e. operating theatres) that, therefore, would likely have similar plant. The aforementioned development had an external 'chiller deck' (which also had heat recovery units, and air conditioning condensers), and a large mechanical plant room containing air handling units. This in principle sounds similar to what will likely be installed at the development that is assessed in this report.

Hence based on the assessment conducted at Sancta Maria Hospital, the following scenario has been modelled to provide an indicative/high level assessment:

- 2 no. rooftop/external chillers - Mitsubishi EACV/EAHV-P900YA-N with a sound power level of 79 dB(A). Not enclosed or screened.
- Reverberant sound pressure level on the inside of the ground floor plant room façade of 80 dB(A) (lower threshold of the Control of Noise at Work Regulations 2005). This assumes the plant room may contain AC units, HRUs, AHUs, pumps, etc. Sound reduction indices of 45 dB R_w for the external wall (blockwork), and 18 dB R_w for the doors on the south elevation (assuming single bank acoustic louvred doors).

A set of indicative noise predictions have been based upon this scenario. These have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in ISO 9613-2:1996, as detailed in **Appendix D**.

The scenario has been modelled in three different variants, with the two chillers on the southern part of the roof (**Figure D.2**), the middle part (**Figure D.3**), and the northern part (**Figure D.4**). These figures show the predicted *specific noise level* (dB L_{Aeq}) outside of the facades of the nearby residential dwellings.

Table 5.3 summarises the result by showing the highest *specific noise level* at each NSR location.

As per **Section 3.2**, a rating level penalty should be applied when assessing in accordance with BS 4142:2014. PJA propose that a 3 dB penalty is applied, as whilst the noise is unlikely to be perceptibly tonal, as is highly unlikely to be impulsive or intermittent, it may be otherwise distinguishable against the residual acoustic environment.

Table 5.3 – BS 4142 assessment result

Period	Specific Noise Level at worst-case facade $L_{Aeq,T}$ (dB)	Rating Level Penalties (dB)	Predicted Rating Level $L_{Ar,Tr}$ (dB)	Rating Level Limit $L_{Ar,Tr}$ (dB)	Difference (dB)
Daytime (07:00 – 23:00) T = 1-hour	35	+3	38	44	-6
Night-time (23:00 – 07:00) T = 15-minutes				41	-3

The resultant rating level is seen to be 3 dB below the night-time representative background sound level, and 6 dB below the daytime level. This in principle demonstrates that the proposed development can operate with an acceptably low noise impact on residential properties.

Evidentially, this is based upon an indicative scenario - PJA recognises that this aspect is likely to be conditioned in any planning approval with the requirement for a further assessment to demonstrate that the noise limits will be achieved once the project reaches the technical design stage.

It should also be recognised that mitigation may be necessary to reduce the noise impact on the new building itself, as well as the surrounding hospital, and not just nearby residents.

- Acoustic louvres may be required to the ground floor plant room, rather than standard weather louvres, if this room required ventilation.
- Externally mounted plant such as chillers and air handling equipment may require a solid or louvred screen to create a compound, or at worst, a full ventilated enclosure (with roof).
- AHU and MVHR systems are likely to require in-duct silencers on the atmospheric side. This is not an unusual requirement as such measures are included in the large majority of ventilation systems.

It is seen to be the responsibility of the developer and design team involved with the mechanical plant design to ensure that the rating levels herein are not exceeded. It must be remembered that the rating level included for plus the addition of any 'penalties' which account for the characteristic features of the sound which may attract attention to it, such as tonality, impulsivity, intermittency, and any other sound characteristics that *"are readily distinctive against the residual acoustic environment"*.

In the case of a mechanical ventilation system, the noise is highly unlikely to have an impulsive character and is unlikely to be intermittent. It could, however, be tonal (a 2 to 6 dB penalty) or be distinctive against the residual noise climate (a 3 dB penalty). Therefore, the M&E design should take this into account when specifying plant units, silencers, louvres, and any other form of noise mitigation.

In summary, plant noise emissions should not pose a significant constraint on the proposed development and the site location is considered suitable in this respect. PJA recognise that this aspect is likely to be conditioned with the requirement for a further assessment to demonstrate that the noise limits will be achieved once the project reaches the technical design stage.

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.1 – Glossary of acoustic terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2×10^{-5} Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4000Hz (4kHz). This is roughly equal to the range of frequencies on a piano.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. This parameter is typically considered as a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
$L_{A90,T}$	The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level'.
$L_{A10,T}$	The A-weighted noise level that is exceeded for 10% of the measurement period T. This parameter is often considered as the 'average maximum level';
$L_{AFmax,T}$	The maximum A-weighted noise level during the measurement period T.

A.2 – Subjective Changes in Noise Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B - BS 4142:2014

BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations within the context of the existing sound environment.

B.1 - Definitions

BS 4142:2014 provides the following definitions which are relevant at this pre-construction stage of assessment:

- **Background Sound Level, $L_{A90,T}$:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given interval, T , measured using time weighting F and quoted to the nearest whole number of decibels.
- **Rating Level, $L_{A,r,T,r}$:** Specific sound level plus any adjustment for the characteristic features of the sound.
- **Reference Time Interval, T_r :** Specified interval over which the specific sound level is determined. This is 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).
- **Specific Sound Level, $L_s = L_{Aeq,T,r}$:** Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .
- **Specific Sound Source:** Sound source being assessed.

The BS 4142:2014 definition of sound of an industrial and/or commercial nature includes *"sound from fixed installations which comprise mechanical and electrical plant and equipment"*. The scope of BS 4142:2014 is not intended for sound from the passage of vehicles on public roads; people; and 'other sources falling within the scopes of other standards or guidance'.

B.2 - Specific Sound Level

The specific sound level L_s is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r , of 60-minutes during the day (07:00 – 23:00) and 15-minutes at night (23:00 – 07:00).

B.3 - Rating Level

The rating level $L_{A,r,T,r}$ is the specific sound level L_s plus any 'penalties' which account for the characteristic features of the sound.

BS 4142:2014 provides the following with respect to the application of penalties to account for *"the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention"*.

- **Tonality** – For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB

for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible;

- **Impulsivity** – A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible;
- **Intermittency** – When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied; and
- **Other Sound Characteristics** – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

PJA consider the word 'perceptible' to be important, and variable depending on the context of a site. For example at a site with a relatively high background sound level of 50 dB(A), an 'impulsive' sound source with a specific sound level of 30 dB(A) at an NSR is unlikely to be perceptible and should probably not be penalised.

However, the same source at a site with a lower background level of 30 dB(A) would be perceptible, and therefore a penalty of 3 or 6 dB could be applied to the rating level, with possibly a 9 dB penalty being applied if the specific sound level were to rise from 30 to 40 dB(A). Therefore the context is important in applying rating level penalties.

B.4 - Background Sound Level

BS 4142:2014 states that *"in using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

BS 4142:2014 further states that *"a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value"*. Hence BS 4142:2014 does not provide a 'black and white' method of obtaining the assessment level for background sound $L_{A90,T}$.

B.5 - Assessment of Adverse Impact

The assessment of adverse impact contained in BS 4142:2014 is undertaken by comparing the rating level $L_{A,r,T,r}$ to the measured representative background sound level $L_{A90,T}$ outside the sensitive receptor location.

The significance of the impact of an industrial or commercial sound source depends on both the margin by which the rating level $L_{A,r,T,r}$ exceeds the background sound level $L_{A90,T}$ and the context in which the sound occurs. It is therefore essential to place the sound in context. But in general *"the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Appendix C – Noise Survey Details

C.1 – Survey Equipment

The monitoring equipment used for the baseline noise survey is detailed in the table below. The sound level meter was calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meter has been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrators have been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

Table C.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Calibration Due
Pulsar Quantifier 95 Class 1 Sound Level Meter	B21270	Oct-20	Oct-22
Pulsar MK:244 Class 1 Microphone	20043748	Oct-20	Oct-22
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	Nov-21	Nov-23

C.2 – Photographs

Figure C.1 – Photographs of the noise monitoring position



Appendix D – Plant Noise Calculations

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in ISO 9613-2:1996.

All of the objects within the model (buildings, roads, barriers, foliage, etc) have been imported from OpenStreetMap or drawn in manually where the OSM did not contain sufficient data. The heights of the buildings and roads have been based upon Google Earth Pro, using the 3D view to be able to measure the elevation heights at the tops of objects, and then inserting this manually into the model. Lastly, the scaled site plan, floor plan, and elevation for the proposed development have been accounted for in the model.

The noise model has assumed:

- a ground absorption factor of 0 in all areas as a worst-case
- a maximum reflection factor of two where buildings and barriers are assumed to have a 'smooth' reflective façade, as a worst-case;
- receptor heights on the façade at ground floor and 1st floor levels – with the map showing the highest values (typically the 1st floor)
- the noise contour map plotted at a height of 4.3m (1st floor window height) – as are receptors away from the buildings;
- atmospheric sound absorption based upon a temperature of 10°C and a humidity level of 70%, as per Table 2 of ISO 9613-2:1996.

The noise model has been used to predict the resulting $L_{Aeq,1hr}$ specific noise levels from the plant – outside of the facades of nearby residential buildings.

The images on the following pages contain screenshots from the mapping.

Figure D.1 – 3D views of the noise model setup

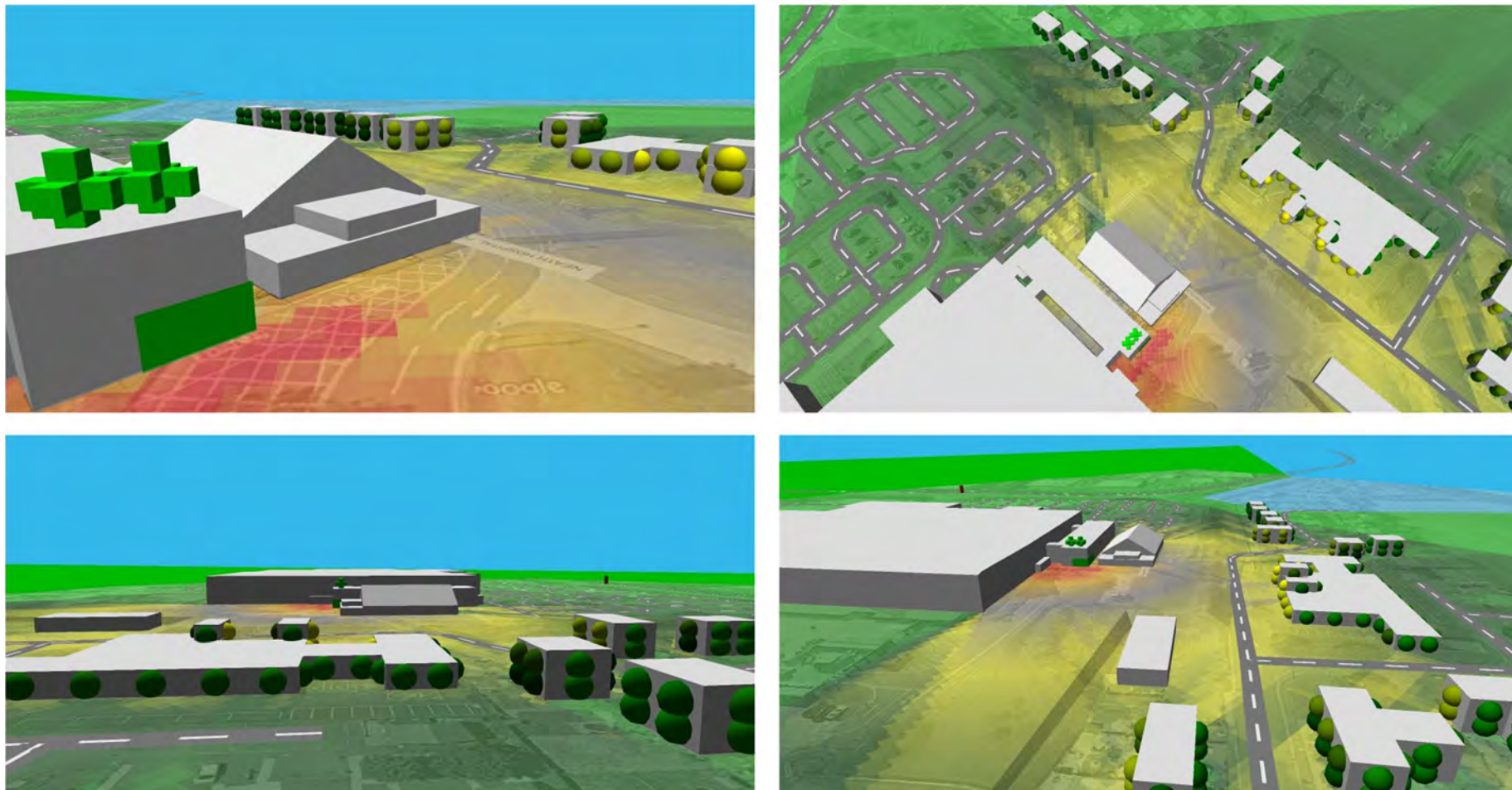


Figure D.2 – Predicted specific noise levels (dB L_{Aeq,1hr}) – 2 x chillers on south roof

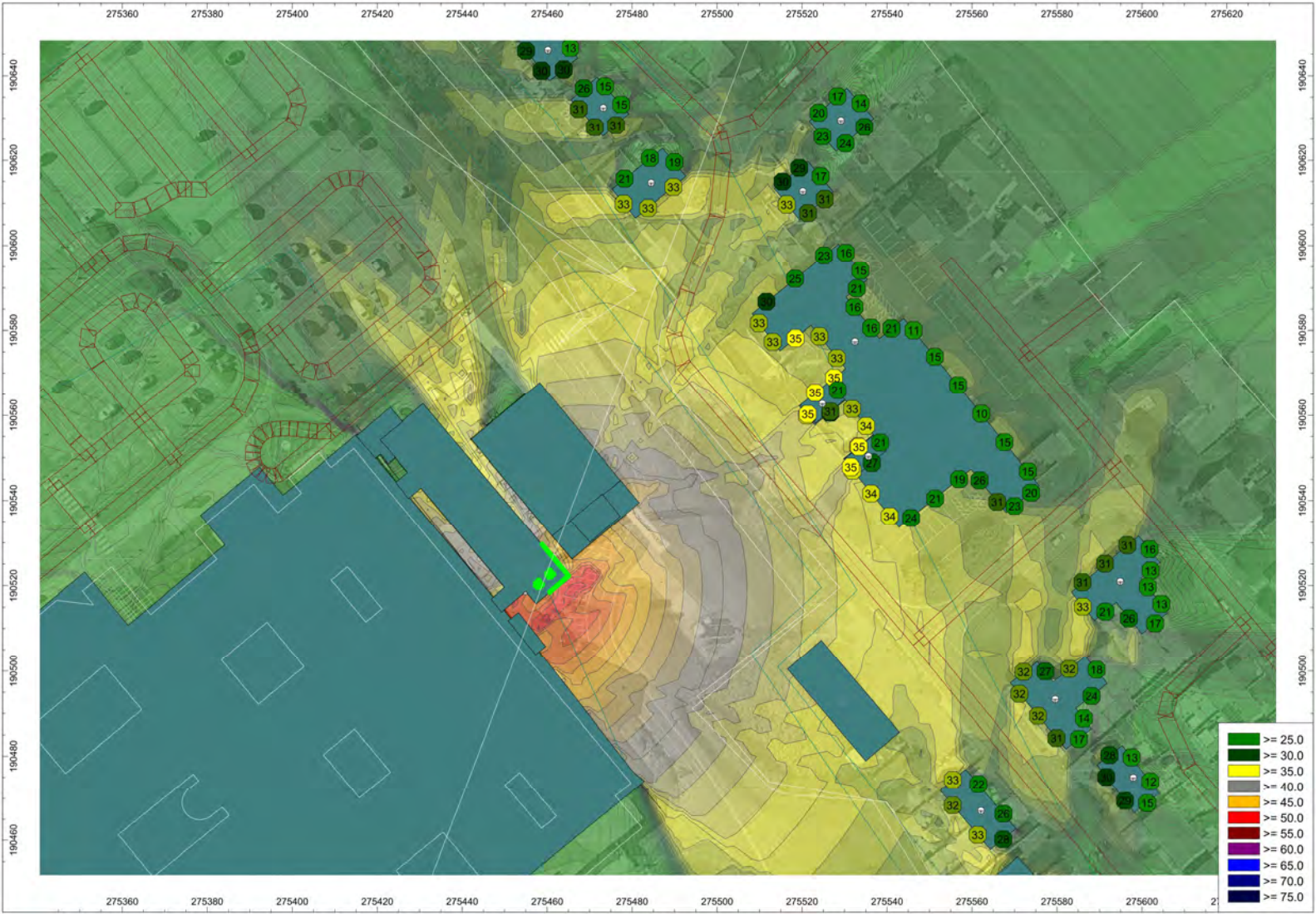


Figure D.3 – Predicted specific noise levels (dB LAeq,1hr) – 2 x chillers on middle roof

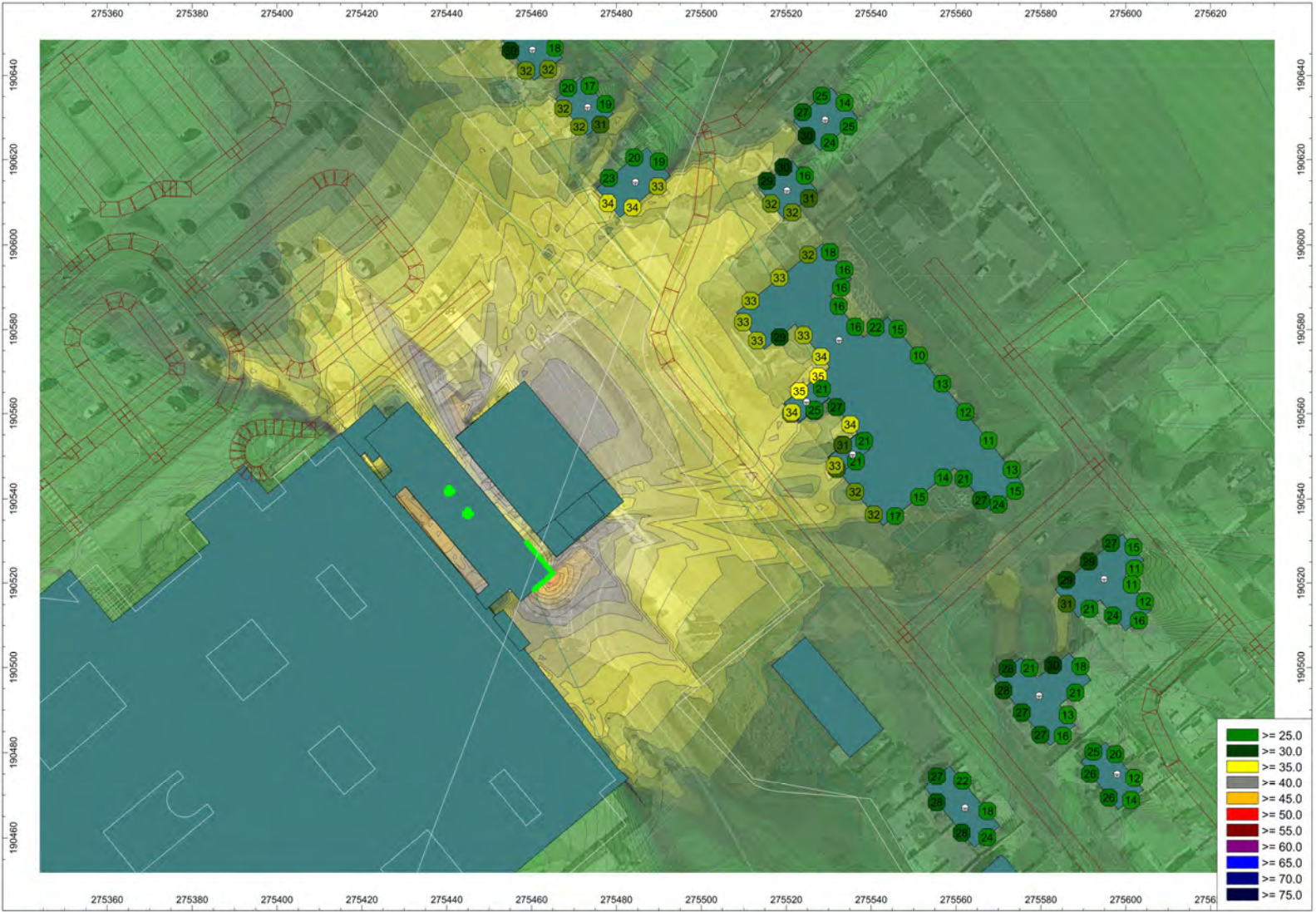
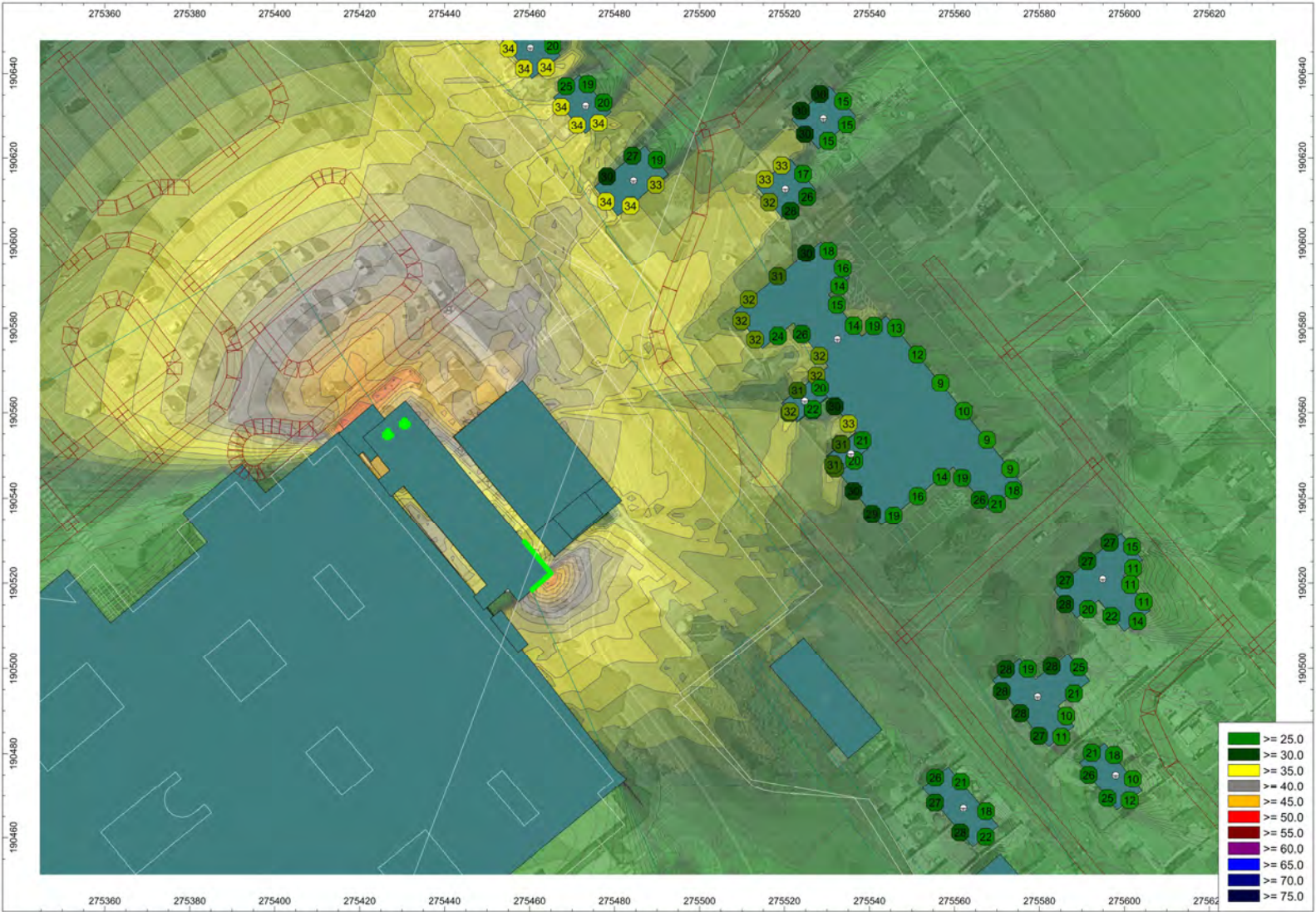


Figure D.4 – Predicted specific noise levels (dB L_{Aeq,1hr}) – 2 x chillers on north roof





ParkerJones Acoustics Limited

Bristol

11 Bankside Road
Brislington
Bristol
BS4 4LB

London

29 Lincoln's Inn Fields
Holborn
London
WC2A 3EE

Glasgow

126 West Regent Street
Glasgow
G2 2RQ

+44 (0)800 830 3338

+44 (0)117 914 6558

info@parkerjonesacoustics.com

www.parkerjonesacoustics.com

Registered in England and Wales

Company No. 12235614