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VANTAGE NORTH ACTON ROAD - LHR21

NOISE IMPACT ASSESSMENT

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SUMMARY

The proposed LHR21 Vantage Datacentre is located at the OPDC Strategic Industrial Location in London. The facility will operate 24 hours a day. The nearest residential properties are around 35m away.

Noise emissions from the facility have been calculated using proprietary modelling software and noise data for the plant and processes at the site. The Rating Noise level has been compared to the existing background noise levels measured at the nearest properties and assessed in accordance with BS4142:2014 +A1:2019 and noise limits in London Borough of Ealing's SPG 10.

During normal operation noise levels from the facility are expected to be at least 5dB lower than the background noise level at the closest properties. The noise impact of the proposed facility is expected to be low.

During emergency conditions when back-up generators are running, noise levels are expected to be no more than 5dB above the background level and the impact is expected to be minor to moderate.

1. INTRODUCTION

This noise assessment has been prepared by Ramboll UK Limited ('Ramboll') on behalf of Vantage Datacentres Ltd in support of an Environmental Permitting Application for a new datacentre located at a site at 37-39 North Acton Road, London ('the Site').

The development comprises:

- A six-storey data centre building (Use Class B8) with a maximum height of 40 m AOD (excluding external ventilation flues) and a gross internal area of 15,340 sqm
- Generator plant, a loading bay, associated electrical equipment rooms and rooftop plant.
- Associated landscaping, hardstanding, fencing, parking
- Full security fencing, vehicle and pedestrian access points with integrated telecommunications boxes
- Associated services, such as refuse storage, lighting, and closed-circuit television cameras.

This report provides an assessment of the impact of operational and plant noise.

Noise emissions from operation of the facility have been calculated using proprietary modelling software. The impact of proposed operations has been assessed in accordance with BS4142:2014+ A1 2019 and compared to background noise levels measured at the nearest properties.

The impact of noise from operation of the plant and associated vehicle movements has been assessed. The scheme is not expected to generate any significant levels of ground borne vibration and an assessment of vibration is not considered necessary due to the distance to the nearest properties.

This report is prepared in support of the permitting application for the scheme. It is not intended to represent a full acoustic design of the facility. Specifications for plant and other noise sources used in this assessment have been provided by the Contractor and are solely for the purpose of assessing the noise impact of the scheme.

1.1 Location

The proposed site is located in the OPDC Strategic Industrial Location (SIL) in the London Borough of Ealing. Figures 1 and 2 show the redline boundary for the site and the site in the wider context of the surrounding area.

Vehicular access to the site is off North Acton Road. The site is set in a predominantly industrial area with a relatively small residential area to the south west of the site, which is surrounded by other industrial uses on all sides (see Figure 4). There is a recreation ground immediately to the south of the proposed site and the noise impact upon this area has been considered.

Figure 1 – Site location

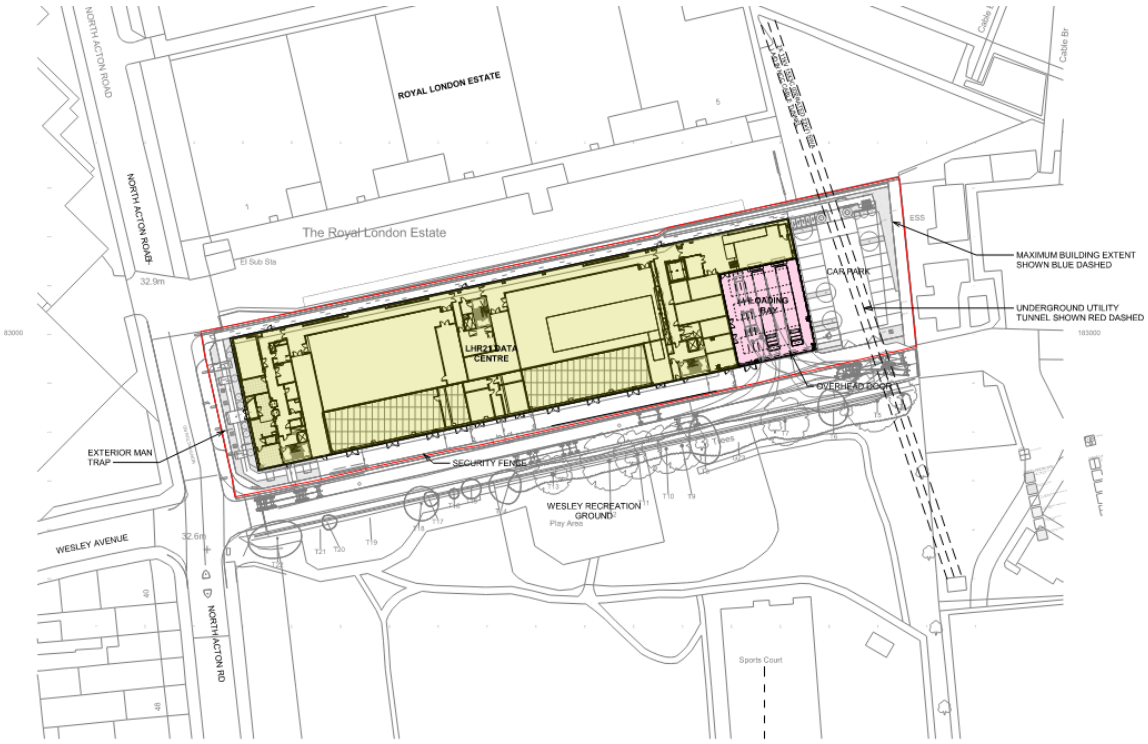

Figure 2 – Red line boundary and general site layout (ground floor shown)

1.2 Proposed Facility

The Vantage LHR21 facility will comprise a single 6-storey datacentre building with associated plant and emergency generators. The building will have a number of chillers on the roof to provide cooling for the equipment inside and other items of plant provide air handling and ancillary functions.

14 emergency generators (one of which will be a backup and will not typically run) will be located over the 5 storeys at the eastern end of the building (2 at roof level, 4 on each of the three levels below this). These will be surrounded by a perforated visual screen with exhaust stacks terminating above the roof level of the building. Generators will only run in emergency conditions, plus regular daytime testing.

The facility will operate 24 hours, although HGV and other vehicle movements are not normally expected at night.

2. NOISE GUIDANCE

2.1 London Borough of Ealing Supplementary Planning Guidance SPG 10 '*Noise And Vibration*'

The application site falls under the jurisdiction of Old Oak and Park Royal Development Corporation (OPDC). However, OPDC have advised that they do not have any of their own guidance specific to noise and they refer to the planning guidance produced by the particular borough, in this case the London Borough of Ealing's SPG 10.

Table 3A3 of SPG10 details that the rating level of noise emitted from the proposed development shall be at least 5 dBA below the background noise level $L_{A90,1hr}$, measured at 3.5m from ground floor façades (i.e. free field), and 1m from upper floor façades at the nearest affected premises, following the procedure set out in BS 4142:1997 (superseded).

SPG 10 is retained as Interim Guidance pending publication of replacement Supplementary Planning documents. The plant noise criterion from SPG 10 has been used in the plant noise assessment and the design of the scheme.

2.2 British Standard 4142: 2014 +A1:2019 Method for rating and assessing industrial and commercial sound

BS 4142:2014[1] provides a method for rating industrial and commercial sound and method for assessing resulting impacts upon people. The method is applicable to fixed plant installations, sound from industrial and manufacturing process and other associated activities.

The basis of BS4142 is a comparison between the background noise level in the vicinity of residential locations and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

i. Background Level, $L_{A90,T}$: defined in the Standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, and quoted to the nearest whole number of decibels;
ii. Specific Level, $L_{Aeq,T}$: the equivalent continuous 'A' weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
iii. Rating Level, $L_{Ar,T}$: the specific sound level plus any adjustment made for the characteristic features of the noise.

Potential impacts are predicted from the difference between the representative background level at a noise sensitive receptor and the rating level from the noise source considered. The standard suggests that the greater the difference, the greater the magnitude of impact.

Section 11 of BS 4142:2014+A1:2019 gives guidance for significance of impacts in reference to comparing rating noise levels against existing background noise levels:

i. Typically, the greater this difference, the greater the magnitude of the impact;

[1] British Standards Institute, 2014. British Standard BS 4142:2014 +A1:2019 Methods for rating and assessing industrial and commercial sound. BSI.

ii. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
iii. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
iv. 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.

BS 4142 details that the representative background noise level should be derived from the full range of background noise levels and should not be assumed to equal to the minimum or modal value. BS 4142 recommends statistical analysis of the measured periods of background noise levels in order to calculate the most representative noise level.

In determining the significance of the impact, BS 4142 requires a consideration of the context of the assessment i.e. the nature of the existing acoustic environment and the new noise source, and the sensitivity of the affected receptors.

Noise Characteristics and Penalties

BS 4142 applies different penalties for noise sources that have an acoustic feature. These penalties are applied to the plant noise level where such features increase attention to the noise, such as tonality and intermittent operation (kicking in and out).

BS 4142 gives a guide to the level of penalty that should be applied, summarised below.

Tonality

- *Tone just perceptible at the receptor: +2dB*
- *Tone clearly perceptible at the receptor: +4dB*
- *Tone highly perceptible at the receptor: +6dB*

Impulsivity

- *Sound that is highly impulsive just perceptible at the noise receptor: +3dB*
- *Sound that is highly impulsive clearly perceptible at the receptor: +6dB*
- *Sound that is highly impulsive highly perceptible at the receptor: +9dB*

Intermittency

- *Identifiable on/off conditions, readily distinctive against the residual acoustic environment: +3dB*

2.3 Noise Effect Levels - Planning Practice Guidance

Planning Practice Guidance (PPG) is a web-based resource, which includes a section on noise. This resource provides guidance on how to determine the noise impact in terms of whether a significant adverse effect is likely to occur and/or whether a good standard of amenity can be achieved.

In line with the Noise Policy Statement for England, Planning Practice Guidance introduces the following concepts:

- Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected;
- No observed adverse effect level (NOAEL): this is the level of noise exposure where noise can be heard, but does not cause any change in behaviour, attitude or other physiological response; and
- No observed effect level (NOEL): this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 1 summarises the noise exposure hierarchy, based on the likely average response.

Perception	Examples of outcome	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures
No Observed Adverse Effect Level			
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 - Noise exposure hierarchy

2.4 British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

In brief, BS8233[2] gives guideline values for internal ambient noise levels in dwellings as set out below.

Location	07:00 – 23:00	23:00 – 07:00
Living Room	35dB LAeq,16hour	-
Dining Room	40dB LAeq,16hour	-
Bedroom	35dB LAeq,16hour	30dB LAeq,8hour

Table 2 – BS8233 guideline internal noise levels

In addition, guidance is given (which is based on that in WHO Guidelines[3]) on noise levels suitable in external amenity spaces:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments*".

[2] British Standards Institute, 2014. British Standard BS 4142:2014 +A1:2019 Methods for rating and assessing industrial and commercial sound. BSI.

[3] World Health Organisation, 1999. Guidelines for Community Noise.

3. METHODOLOGY

The following section outlines the methodology applied to assess the potential noise impacts created by the proposed development.

3.1 Receptor Locations

The receptors considered in this assessment are detailed in Table 3 and Figure 3.

Location	Description	Distance from site at closest point
R1	Houses on North Acton Road	35m
R2	Houses on Wesley Avenue	65m
R3	Wesley Playing Fields	15m

Table 3 – Nearest noise sensitive receptors

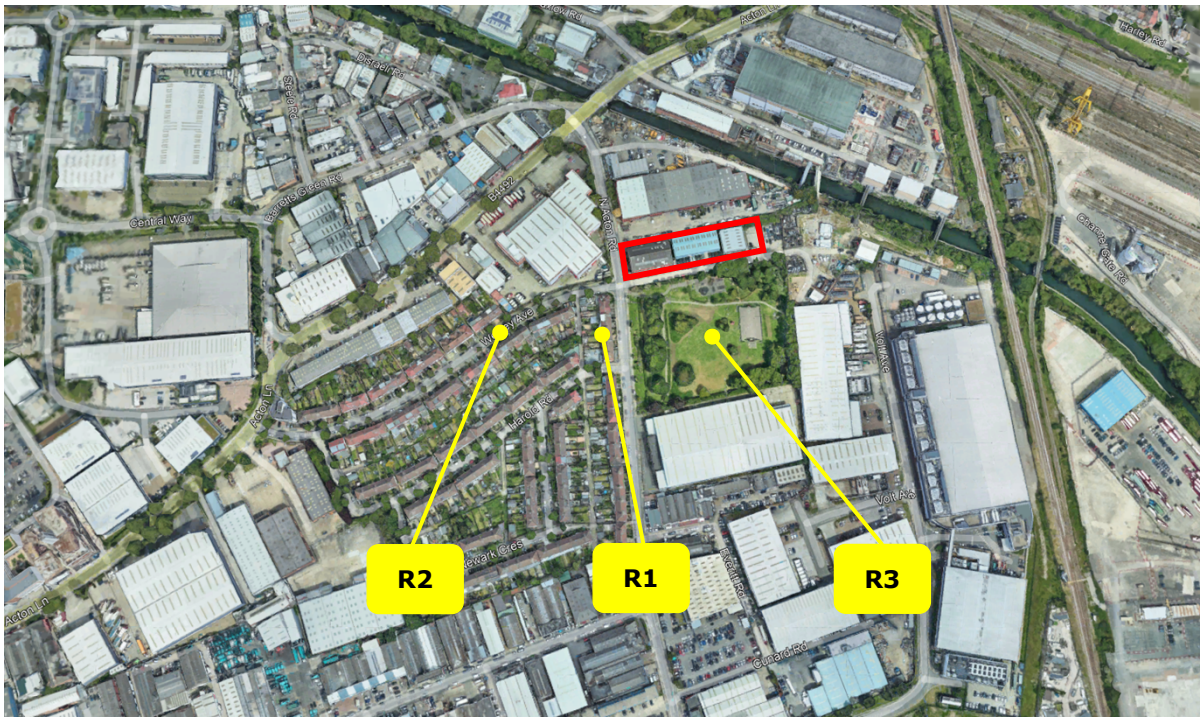

Figure 3 – Locations of nearest noise sensitive properties

3.2 Noise Survey Methodology

An unattended noise logger was used to measure noise levels in the area continuously for a 48-hour period. Additional attended measurements were undertaken at various locations around the area to assess the baseline noise levels at the noise sensitive receptors.

3.3 Operational noise limits

The scheme has been designed to meet noise limits set based on Local Authority requirements and the background noise levels measured during the baseline survey. Proposed rating noise level limits have been set as shown below, allowing for any penalties for acoustic characteristics of the noise. During emergency operation, it is appropriate for standby equipment to be designed to a relaxed criterion. Therefore, the rating level during emergency operation (or testing) has been set at 5 dB above background noise levels.

Conditions	**Plant Rating Noise Limit**
Normal	-5 dB below the typical background noise level (L_{A90})
Emergency and testing/maintenance of standby generators	+5 dB over the typical background noise level (L_{A90})

Table 4 - Operational plant rating noise limits

3.4 Significance criteria

Significance criteria have been defined for the different sources of noise in accordance with the principles in Planning Practice Guidance (PPG). Table 5 details the significance of effects for operational noise based on the numerical difference between predicted rating level and the prevailing background level at a receptor and the criteria from BS 4142:2014+A1:2019.

Description	Effect level	Magnitude of Impact
Predicted Rating Level is 5 dB or more below the prevailing Background Level at the receptor.	NOEL	Negligible
Predicted Rating Level is between 5 dB and -0.1 dB below the prevailing Background Level at the receptor.	NOAEL	Minor
Predicted Rating Level is between 0 dB and 4.9 dB above the prevailing Background Level at the receptor.	LOAEL	Moderate
Predicted Rating Level is between 5 dB and 9.9 dB above the prevailing Background Level at the receptor.	SOAEL	Major
Predicted Rating Level is ≥10 dB or more above the prevailing Background Level at the receptor.	SOAEL	Major

Table 5 - Operational noise significance criteria (non-emergency)

3.5 Assumptions and Limitations

All reasonable measures have been undertaken to reduce uncertainty in the baseline noise survey data and the calculations detailed in this report.

Uncertainty has been minimised by completing continuous unattended measurements for an extended duration, as well as several short term measurements, to get a good sample of typical noise levels in the area.

Results have been rounded to the nearest A-weighted decibel.

The noise prediction model accounts for intervening topography and existing building massing. The model uses the calculation method of ISO9613-2:1996.

Plant noise emissions are based on data for the proposed plant which includes the spectral content to account for the way different frequencies of sound propagate.

The assessments and calculations undertaken in this report are based on data and plans of the proposed development provided by the client and consultees.

4. NOISE SURVEY

An unattended noise logger was used to measure noise levels continuously between Wednesday 18th and Friday 20th May 2022.

Additional attended measurements were undertaken on 18th May at various locations around the site to assess the baseline noise levels at other noise sensitive receptors.

The measurement duration was 15 minutes for attended measurements and the logger was set to measure at 5-minute intervals to give a better picture of fluctuations in noise levels. BS4142 typically recommends measurement intervals of 15 minutes at night, however the shorter measurement duration is considered suitable to assess noise climate at these locations as the background noise generally remains reasonably steady throughout the day and night periods. Any difference between 5 minute and 15 minute L_{A90} levels is expected to be small.

The sound level meter's calibration was checked immediately before and after the measurement periods. No significant drift in calibration was detected.

4.1 Measurement locations

Figure 4 shows the measurement locations.

LT1 is the noise logger and is representative of the noise climate of the nearest residential receptors along North Acton Road as it is a similar distance from the road, which is the dominant source of noise.

ST1 is representative of the houses along Wesley Avenue, that are further from North Acton Road and more screened from traffic noise on this road.

ST2 is representative of the Wesley Playing Fields.

Figure 4 - Measurement locations

4.2 Equipment

The following measurement equipment was used to conduct the survey:

- *1x* Norsonic 140 Sound Level Analyser (1403396)
- *2x* Nor1225 1/2" IEC61672 Class 1 Microphone
- *1x* Norsonic 1251 Calibrator (34964)
- *1x* NTI XL2 TA Sound Level Meter (A2A-09209-E0)

All measurement equipment owned or hired and operated by Ramboll Acoustics has annual calibration checks carried out by external companies traceable to national standards. Copies of all calibration records are kept and can be provided upon request.

4.3 Weather Conditions

The weather during the survey period is detailed below.

Date	Average Temperature (°C)	Average Windspeed (m/s)	Total Daily Precipitation (mm)
18/05/2022	17.6	4.2	0
19/05/2022	17.2	3.4	0
20/05/2022	14.1	4.5	0

Table 6 - Weather conditions

The weather conditions during the survey period are not considered to have had any adverse effects on the measured noise levels.

4.4 Survey Results

The summarised results from the noise logger at position LT1 are presented in Table 7 below. Full logger data is presented in a graph in Figure 5.

		Typical Ambient Noise Levels (L_{Aeq} dB)	Typical Background Noise Level (L_{A90} dB)
LT1 – representative of N Acton Rd	Day (0700-2300)	59	48
	Night (2300-0700)	51	42

Table 7 - Summarised Logger Noise Data

Table 8 below presents the measured noise levels at ST1 and ST2.

		Ambient Noise Levels ($L_{Aeq,15min}$ dB)	Background Noise Levels ($L_{A90,15min}$ dB)
ST1 – Wesley Avenue	11:49	50	42
	12:34	56	44
	13:14	55	43
ST2 - Park	11:29	47	43
	12:14	51	45
	12:55	49	45

Table 8 - Summarised Attended Measurement Noise Data

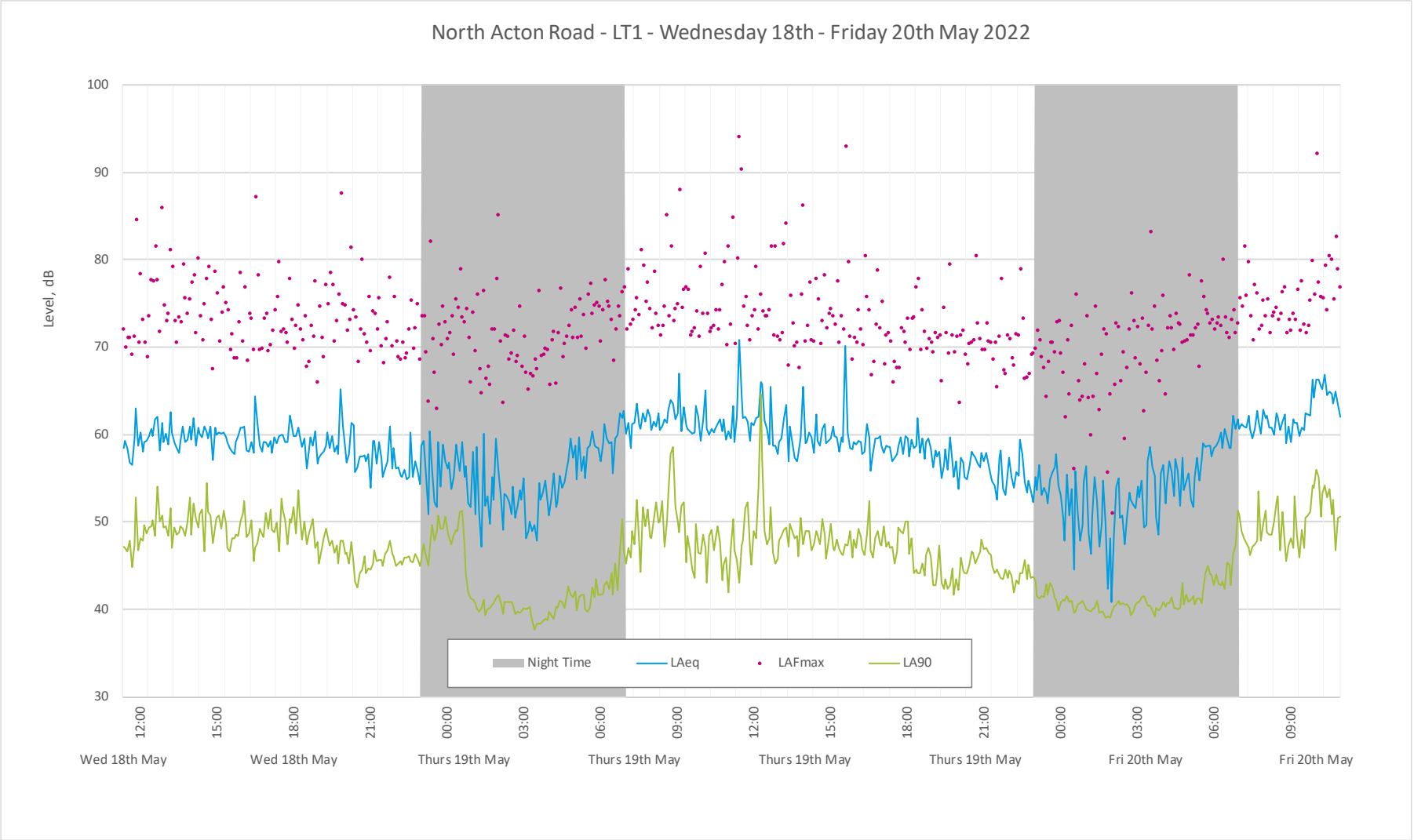

Figure 5 - Noise levels measured at position L

5. PLANT NOISE LIMITS

5.1 Plant operation

The data centre will include chiller equipment, generators and ancillary plant such as air handling and extract. The chillers and other ancillary plant would operate continuously during daytime and night-time periods. Generators would only be required to be operational during power failures and briefly for testing and maintenance during the day.

5.2 Typical background noise levels

Based on the noise survey results, and statistical analysis of the measured background noise levels in accordance with guidance set out in BS 4142:2014+A1:2019, the following background noise levels have been used to set noise limits for 24 hour operation:

Houses on North Acton Road: 42 dB L_{A90} is deemed to be the typical background noise level based on the noise logger LT1 at night (Figure 6). During the day background levels are typically 48 dB L_{A90} (note that the measured levels are consistent with the levels measured by others in the 2020 noise assessment that accompanied the outline planning application and the Contractor's noise survey done in May 2023).

Houses on Wesley Avenue: Background levels during the day at position ST1 are around 4dB lower than those at the noise logger LT1. Since the noise at ST1 is generally due to traffic on North Acton Road, logger data for the night time has been reduced by 4dB to estimate the typical background level at these properties at night, namely 38 dB $L_{A90.}$
During the day background levels are typically 43 dB L_{A90} based on the measurements at ST1.

Wesley Playing Fields: This area is unlikely to be used at night, so amenity to users has been considered during the daytime only. Based on the measurements at ST2 during the day, the typical background level here is taken to be 45 dB L_{A90}. Note that the assessment methodology in BS4142 is not strictly applicable to communal amenity areas but has been used to provide an indicative assessment of impact.

5.3 Plant noise limits

The rating sound level from fixed plant installations has been set 5 dB below the representative background noise level (L_{A90}) during the night-time, as operation of the facility will be 24 hours. During emergency operation, it is appropriate for standby equipment to be designed to a relaxed criterion. Therefore, the rating level during emergency operation (or testing) has been set at 5 dB above background noise levels.

The proposed plant noise limits are set out in Table 9. The rating level should include any penalties to the methodology of BS 4142:2014+A1:2019. The sum of all fixed plant installations is designed to meet the total plant noise rating levels of Table 9.

	Time	Representative background noise level dB L_{A90}	Plant noise rating level dB L_{Ar} at sensitive receptors
Houses on N Acton Rd	24 hour normal operation[1]	42	**37**
	Emergency operation[1]	42	**47**
	Testing of emergency plant (daytime only)	48	**53**
Houses on Wesley Av	24 hour normal operation[1]	38	**33**
	Emergency operation[1]	38	**43**
	Testing of emergency plant (daytime only)	43	**48**
Wesley Playing Fields (daytime impact only)	Normal operation (daytime only)	45	**40**
	Emergency operation (daytime only)	45	**50**
	Testing of emergency plant (daytime only)	45	**50**

[1] Limit based on typical night time (23:00-07:00) background level

Table 9 - Plant noise rating level limits

6. NOISE SOURCES

6.1 Noise Levels used in Modelling

Noise levels from operational and emergency plant have been calculated using proprietary modelling software (CadnaA), Plant selections and operating duties have been provided by the Contractor for the scheme. Plant selections have been taken from the Contractor's schedules and sound power levels (including frequency data) has been taken from manufacturers datasheets. In some cases, sound levels for part-load operation have been provided by the manufacturer. Modelling has been done using full octave frequency spectrum data.

A summary of the noise sources included in the noise modelling exercise is given below.

Noise Source	Data Used	No. of Sources	Sound Level (per item)
Auxiliary Plant			
DOAS air handling unit (DOAS 1-4)	Weatherite WRLTD024R2074THDDHE - inlet	4	58 dB LwA
	Weatherite WRLTD024R2074THDDHE - discharge	4	67 dB LwA
	Weatherite WRLTD024R2074THDDHE - casing	4	41 dB LwA[1]
DOAS air handling unit (DOAS 5)	Weatherite WRLTD024R2074THDDHE - inlet	1	58 dB LwA
	Weatherite WRLTD024R2074THDDHE - discharge	1	67 dB LwA
	Weatherite WRLTD024R2074THDDHE - casing	1	41 dB LwA[1]
CRAC DX (serving MMR)	Mitsubishi MEGR-MC-A-049 ('034 data used). 50% load	3	64 dB LwA[2]
CRAC DX (serving ER03/ER08)	Mitsubishi MEGR-MC-A-049 ('034 data used) 67% load	6	66 dB LwA[2]
CRAC DX (serving ER03b)	Mitsubishi MEGR-MC-A-034. 50% load	2	65 dB LwA[2]
VRF	Mitsubishi PUMY-P112YKM5	2	69 dB LwA
	Mitsubishi PUMY-P200YKM3	2	75 dB LwA
	Mitsubishi PUMY-P140YKM5	4	71 dB LwA
	Mitsubishi PUHY-P450YNW-A2. 70% speed	5	74 dB LwA[3]
	Mitsubishi PUHY-P500YNW-A2. 70% speed	1	75 dB LwA[3]
Extract fan	Nuaire AM42 (without any attenuator)	2	78 dB LwA
Admin air cooled chiller	Mitsubishi i-NX/S0502P	1	89 dB LwA
Admin Heat Pump (NOT IN USE)	Mitsubishi NX2-N-G06/A/EC/0344	n/a	-[4]

Noise Source	Data Used	No. of Sources	Sound Level (per item)
Main cooling plant			
Air cooled chillers	Schneider BCEF1604. Part load 1600kW Night set-back operation providing 3dB sound reduction	14	Day: 93 dB LwA[5] Ngt: 90 dB LwA[5]
Emergency Plant			
Emergency generator	Spectrum based on Kohler KD3300-F generating set (with attenuation package including exhaust flues)	13 (+1 redundant)	75dB(A)@1m

[1] calculated from fan Lw and manufacturers casing insertion losses

[2] LwA for part-load operation provided by Mitsubishi. Full load = 71dB LwA.

[3] LwA for part-load operation provided by Mitsubishi. Full load: P450 = 84dB LwA. P500 = 82dB LwA.

[4] Heat pump provided as backup to main WSHP system. Not in use in normal operation. Included for information.

[5] Based on sound power measurements to ISO9614-2 provided by Schneider (Manens-Tifs report 05960-ACU-RT3-0 dated 19 January 2023). Measured at 1600kW load = 93dB LwA. Additional 3dB night set-back sound reduction to be confirmed by Contractor/Schneider.

Table 10 – Noise sources used in modelling and assessment

6.2 Key Data used in Modelling

Spectral sound emission and attenuator insertion loss data used for the key items of plant are summarised below.

6.2.1 Chillers

The sound power levels for the Schneider chillers have been provided from a test report commissioned by Schneider. The levels measured for a 1600kW load are given below.

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Schneider BCEF1604A[1]	103[2]	99	90	88	89	85	84	77[2]

[1] data provided by Schneider. Octave band values calculated from third-octave band data.

[2] Estimated level – no data provided for this octave band.

Table 11 - Schneider chiller sound power levels, dB Lw

It is necessary to reduce the sound power level of the chillers when running at night when background levels are lowest. A night set back mode that can achieve a 3dB reduction in overall sound power has been included in the Contractor's design. This has been approximated in the modeling by reducing the sound power in each third octave band by 3dB. The resulting octave band sound power levels used in the modelling are summarised in the table below.

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Schneider BCEF1604A (night set back operation)[1]	100[2]	96	87	85	86	82	81	74[2]

[1] Octave band values calculated from third-octave band data.

[2] Estimated level – no data provided for this octave band.

Table 12 - Chiller reduced night time operating mode

6.2.2 Acoustic Louvre Screening

To further reduce noise from the roof chillers (and other plant), screening around the chiller deck is proposed on the south and west boundaries of the deck. To allow airflow to the chillers, the screening will be formed with acoustic louvres.

The extent of this screening is shown below (taken from the Contractor's Acoustician report).

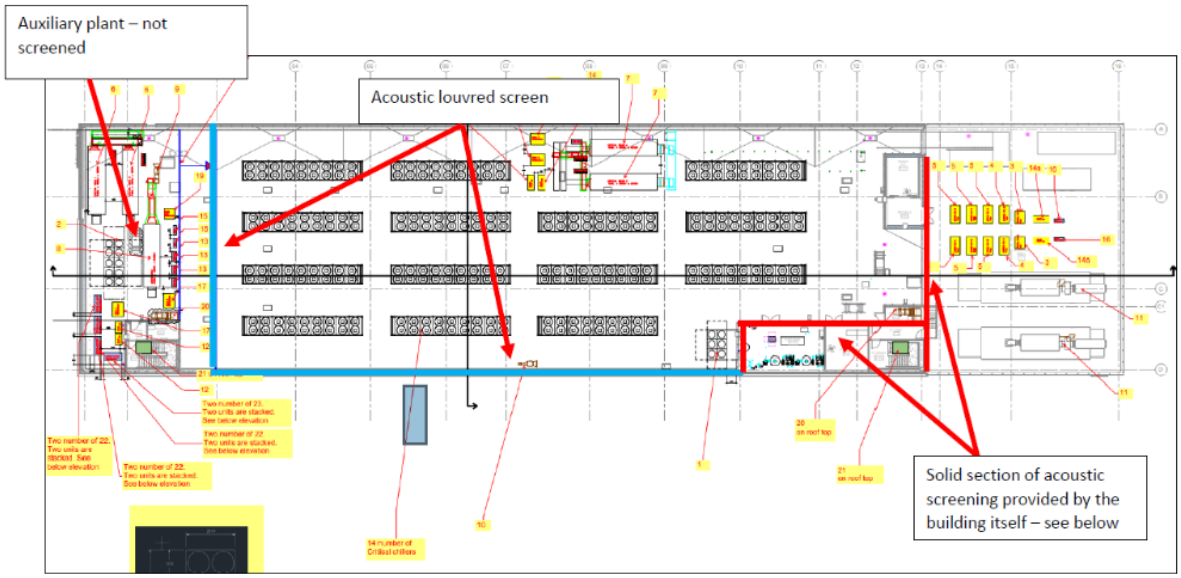

Figure 6 – Extent of louvred screen

The following minimum insertion loss performance is proposed for the acoustic louvres:

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Allaway AL3030D Acoustic Louvre (600mm deep)	6	9	13	15	25	29	27	24

Table 13 - Acoustic louvre specification, dB insertion loss

A parapet of 670mm above roof level has been included around the whole roof, including the auxiliary plant area. The acoustic louvres must extend down to this parapet as a minimum so that there are no gaps between the louvres and the roof.

The louvre has been implemented in the model using a 600mm deep barrier. The sound level on the inside face of the barrier has been calculated and applied to a radiating plane on the outside face of the barrier to represent sound passing through the louvre (see Figure 7). In practice sound passing over the top of the louvred barrier in the model is more significant than that passing through it.

It is assumed that the perforated visual screen around the perimeter of the building does not offer any sound reduction.

6.2.3 Chiller Drip Trays

Drip trays are assumed underneath all chillers that are large enough or adapted to sufficiently enclose the underside of the chiller such that noise emissions from the underside are mitigated.

6.2.4 Generator Gantry

The manufacturer's sound spectrum for the Kohler KD3500 diesel gen set has been used (Table 14) and adjusted such that the overall LwA produces a level of 75dB(A) at 1m from each face of the generator, and the exhaust flue outlet. This has been calibrated at a 1m distance using the modelling software.

In the absence of information on the specific measurement conditions of the sound power level of the generators (an overall figure averaged from measurements all around the generator is provided) and the performance at different frequencies of the provided acoustic package, the modelling software has been used calibrate to a level of 75dB(A)@1m from all faces of the generator using the overall spectrum provided. Reductions to the overall sound power level for each side of the generator and the exhaust are as follows - Top: -32dB, Long sides: -32dB, Ends: -36dB, Exhaust flue: -51dB.

This is an estimate, in the absence of sound pressure or sound power level data for the generator in the specific enclosure, however for estimating the level (in terms of dBA) at the nearest houses during temporary emergency use, the level of accuracy is expected to be adequate.

Note that it is not possible to model the intermediate floors between generators in the modelling software, therefore the LHR12 generators have been modelled stacked above each other as shown in Figure 7. This is not expected to make a significant difference to the calculation of generator sound level emitted from the building overall.

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
KD3500 generating set	119.4	126.3	125.6	118.7	117.7	116.9	114.6	114.7
KD3500 exhaust	129.9	142.9	135.2	129.3	125.4	123.8	125.6	124.2

Table 14 - Kohler KD3500 genset sound power levels (before attenuation package), dB Lw

6.3 Location of noise sources

Noise sources have been included in the model as shown below.

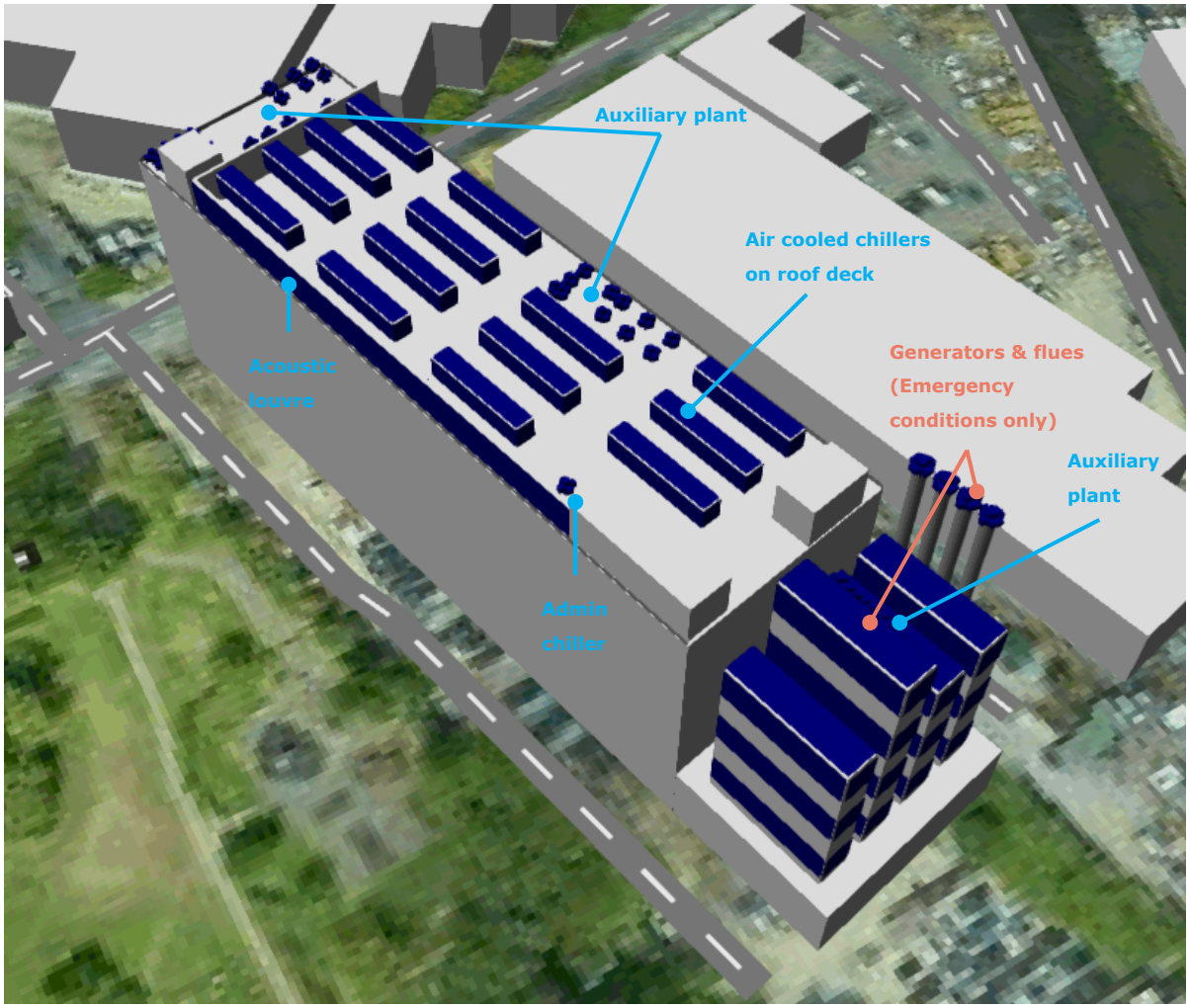

Figure 7 – Noise modelling source locations

6.4 Vehicle Noise

The number of vehicles accessing the site is expected to be low, and significantly less than the volume of traffic on the surrounding roads and wider industrial estate, which is the main source of traffic noise affecting the general area. It is assumed that all HGV movements to the site will be during the day and are infrequent.

Any impact of noise from vehicle movements associated with the scheme is expected to be low.

7. CALCULATED NOISE LEVELS

7.1 Normal Operation

A model of the proposed facility and the surrounding area was created in CadnaA software and used to calculate noise emissions from the facility experienced at the nearest sensitive properties.

7.1.1 Acoustic Penalties

Noise from the facility during normal operation is made up from a large number of diverse plant sources and the cumulative noise is not expected to have any distinct tonality and noise levels are expected to remain steady. Noise levels calculated are very low due to distance and high levels of attenuation and are significantly lower than the typical ambient noise (L_{Aeq}), so any tonality or cycling of plant due to changes in demand are unlikely to be perceivable under normal conditions.

Therefore the Rating Level, $L_{Ar,T}$, is equal to the calculated noise level.

7.1.2 Calculated Plant Noise Levels

Noise levels calculated at the sensitive receptors during normal operation are summarised in Table 15 below. 24 hour operation is assumed. A noise map showing noise emissions across the site and the surrounding area is shown in Figure 8.

Location	Calculated noise level, dB(A)	Typical background noise level, dB LA90	Difference, dB
R1 Houses on North Acton Rd	Day: 40 Night: 37	Day: 48 Night: 42	Day: -8 Night: -5
R2 Houses on Wesley Av	Day: 35 Night: 32	Day: 43 Night: 38	Day: -8 Night: -6
R3 Wesley Playing Fields	Day: 40 Night: n/a	Day: 45 Night: n/a	Day: -5 Night: n/a

Table 15 – Calculated noise levels from LHR21 facility (normal operation)

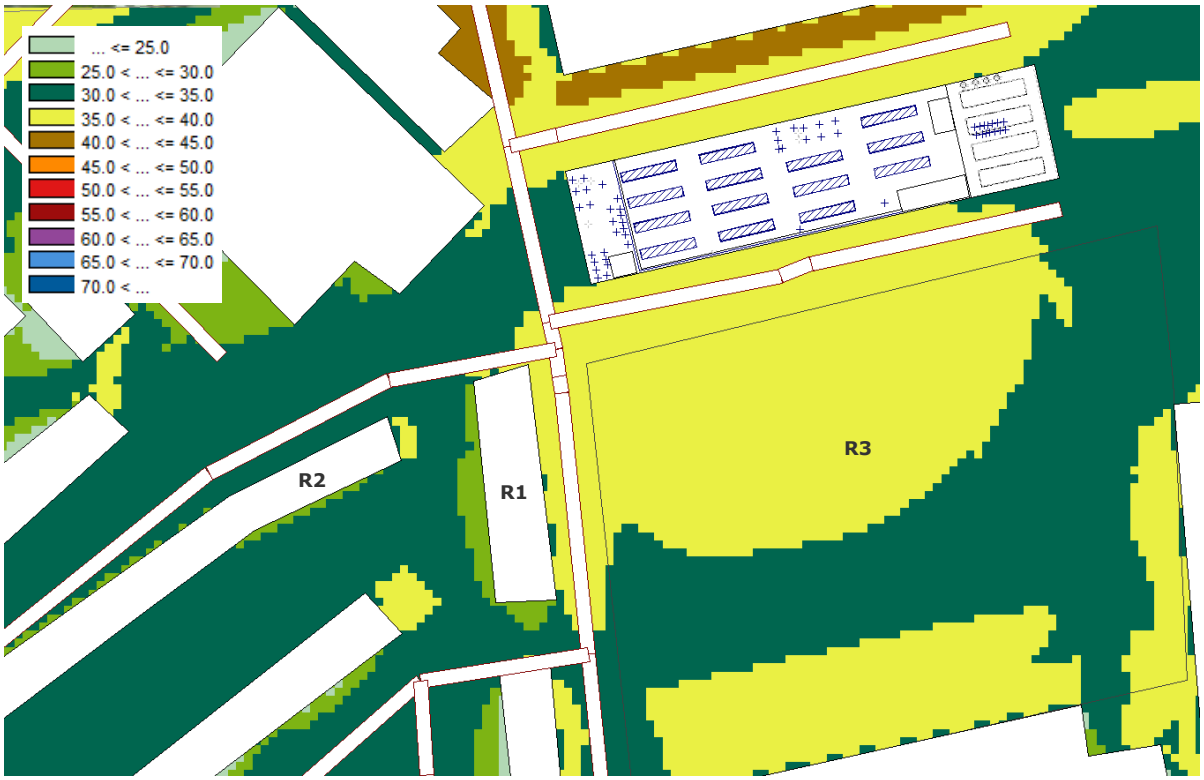

Figure 8 – Calculated noise levels during normal operation at night, dB(A) at 1.5m height - Receivers indicated

7.1.3 Discussion

The cumulative noise level from the LHR21 facility is calculated to be 37dB(A) at the nearest noise sensitive property (North Acton Road, R1) and lower than this at other positions. The proposed noise limits are achieved at all locations. At most positions the noise level is more than 5dB lower than the typical background noise level at night, and significantly lower than the daytime background level.

Calculations have been made based on worst-case data with all plant operating simultaneously at the proposed duties.

On the basis of the worst-case prediction of noise from the LHR21 facility, there is expected to be a low magnitude of impact at the nearest properties.

Given the context of the area and the current industrial and commercial operations in the surrounding area, noise may be heard but is not expected to cause any change in behaviour or significant change in the quality of life.

Noise levels from LHR21 experienced in gardens would generally be lower than 30dB(A) and is unlikely to affect amenity in these areas, particularly in the context of the industrial/commercial nature of the wider area.

7.2 Emergency Conditions

During an emergency situation where power is lost to the facility, the backup generators will run until power is restored. We have calculated the approximate noise level at each receptor based on the worst case of all of the generators running concurrently at full power (as well as the rest of the normal operation plant).

Location	Calculated noise level, dB(A)	Typical background noise level, dB LA90	Difference, dB
R1 Houses on North Acton Rd	Day: 45 Night: 45	Day: 48 Night: 42	Day: -3 Night: +3
R2 Houses on Wesley Av	Day: 38 Night: 37	Day: 43 Night: 38	Day: -5 Night: -1
R3 Wesley Playing Fields	Day: 50 Night: n/a	Day: 45 Night: n/a	Day: +5 Night: n/a

Table 16 – Calculated noise levels from LHR21 facility (normal operation)

On the basis of the affected properties having windows closed under these temporary conditions, internal levels of around 20dB(A) could be expected internally, based on a typical standard double glazed window.

While noise from the generators may be audible, at these internal levels the noise is not likely to be significantly disturbing to sleep at night and is within the internal noise limits set in BS8233. There is expected to be a minor to moderate magnitude of impact at the nearest properties during emergencies.

Generator Testing
It is assumed that generators would be tested during the daytime only and for a limited period. On the basis of the nearest generator to the nearest sensitive receptors running on its own, the level at these locations would be no more than the typical background level.

8. CONCLUSIONS

The proposed LHR21 facility is expected to produce noise levels that are at least 5dB lower than the current typical background noise level at the nearest residential properties during normal operation. Noise levels inside houses and outside in gardens will be below the values given in BS8233 and WHO guidance. As such the noise impact on residents is expected to be low, particularly given the context of the area which has existing industrial and commercial noise sources associated with the wider industrial estate.

Noise during emergency conditions when generators is running is around 5dB above the background level (or lower than this) and the noise impact on residents is expected to be minor to moderate.

Vehicles associated with the facility are expected to be proportionately low in number compared to the existing volumes of traffic in the area and any change in noise level is expected to be negligible.